# REPORT

ON

# VOCATIONAL EDUCATION IN INDIA

## (Delhi; the Punjab and the United Provinces)

By A. ABBOTT, C.B.E.

(formerly H. M. Chief Inspector of Technical Schools,
Board of Education, England.)

WITH A SECTION ON

# GENERAL EDUCATION AND ADMINISTRATION

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BOARD OF EDUCATION,

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LONDON, S. W.

*10th June 1937.*

SIR,

We beg to submit to the Government of India the enclosed Report entitled "Vocational Education in India with a Section on General Education and Administration" which we have prepared as a result of the investigations which we made during our recent visit to India at the invitation of the Government.

We are, Sir,

Your obedient Servants,

A. ABBOTT.

S. H. WOOD.

The Secretary,
Department of Education, Health and Lands,
Government of India,
Simla,
INDIA.

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# INTRODUCTION.

On the 3rd August, 1936, the Government of India addressed a communication to the India Office requesting the Secretary of State to obtain the help of the Board of Education in selecting suitable persons from England to visit India in order to advise on certain problems of educational reorganisation, and particularly on problems of vocational education. The proposal was that a team of ten should be selected, that they should arrive in India not later than the end of October, and that by a division into five groups of two each, one with a knowledge of urban and one with a knowledge of rural educational problems, the whole of India should be covered by the end of March.

The Board of Education were not able, in the time available, to secure the services of so many people competent to advise on the questions at issue and willing to leave England at such short notice. The Board were however very anxious to co-operate with the India Office and the Government of India; and, in due course, we were chosen by the Board, and invited by the Government of India, to visit India as soon as we could in order to study the situation and offer our advice. We ought here to say that though both of us have had experience of rural educational problems neither of us is an agricultural expert.

We arrived in India on November 20th. Circumstances over which we had no control prevented an earlier arrival. We proceeded at once to New Delhi and there we discussed with those authorized to advise us what our plan of campaign should be. Two alternatives presented themselves. We could make a rapid survey of the whole of India or we could concentrate on two, or three, provinces, as we should have done had we been two of the team of ten originally proposed. The date of our departure from India, which we discovered would have to be earlier than was originally intended owing to the "advance bookings" for the Coronation, had to be taken into account in deciding the best way of spending our time.

It appeared to us that if we were to visit the whole of British India so much time would necessarily be taken up in travelling, and in meeting high officials in each province that we should find little opportunity for visiting schools of all types and ascertaining the views and studying the practices of teachers and others actually engaged in the day to day work of education. It was also clear to us, from the beginning, that even an intimate acquaintance with educational provision would not be sufficient for our purpose. Vocational education is a road which leads the adolescent from the region of school to the region of productive employment; and if this road is to be direct and safe both regions must be explored and charted. We should not, therefore, be able to make considered recommendations about vocational education unless we studied the structure, the volume and the conditions of industry and commerce; and this would mean visiting small and large industrial undertakings, conferring with businessmen and ascertaining the amount and nature of the facilities for industrial training already in existence.

These considerations and the fact that both of us, though familiar with the numerous reports on education and on industrial conditions in India, were new

to the country, persuaded us that an intensive study of a limited area would be more profitable than a necessarily cursory survey of the greater part of British India. Accordingly we have limited our investigation, so far as visits are concerned, to three provinces: Delhi, the Punjab and the United Provinces. We have, however, been fortunate in making the acquaintance of, and discussing our problems with, administrators, teachers and others concerned with education from practically every province. In particular we derived much benefit from our attendance at the All-India Education Conference which met in Gwalior in December and to which we were courteously invited.

While we were in New Delhi, and before our investigation was in full swing, we were given the opportunity, which we very much appreciated, of attending a meeting of the Central Advisory Board of Education and of becoming personally acquainted with its members. We also, on separate occasions, had the privilege of meeting all the Directors of Public Instruction, or their deputies, of British India, as well as the Director of Industries in the Punjab and the Deputy Director of Industries in the United Provinces.

*Terms of Reference.*

It will be convenient here to explain the nature of our task by recording our terms of reference as determined by the Central Advisory Board of Education. The terms of reference are as follows :—

" To advise

(1) Whether any vocational or practical training should be imparted in primary, secondary and higher secondary schools and, if so, what should be its nature and extent ?

(2) In the light of the answer to (1), to advise whether the technical or vocational institutions already in existence can be improved and, if so, in what manner and, if new institutions for vocational or technical training be required to suggest ;

(*i*) the type of institutions or institutions required for the purpose ;

(*ii*) the stage at which diversion of the students from the ordinary secondary schools (lower or higher) to such institutions should be effected ; and

(*iii*) the means to be adopted for effecting such diversion, *i.e.*, vocational guidance.

(3) The differentiation or special arrangements needed to meet the special requirements of rural areas, especially in view of the desirability of remedying the trend of the present educational system to draw many boys and girls from rural areas to towns where they receive a purely literary form of education and, by so doing, not only congest still further the high schools, but also become very largely lost to the service of the countryside.

We should explain that the use of the words 'primary', 'secondary' and 'higher secondary' schools rather than the words 'primary', 'middle' and 'high' schools arises from the fact that before our visit the Central Advisory Board of Education had constructed a revised framework of educational

organisation which provides a new terminology. Briefly the new framework expressed in terms of educational stages and classes is as follows :—

(*a*) The Primary State—classes I—IV inclusive ;

(*b*) The Lower Secondary Stage—classes V—VIII inclusive ;

(*c*) The higher secondary Stage—classes IX, X and XI inclusive ;

(*d*) The University Stage a 3 year course for a Degree.

The present organisation is broadly as follows :—

(*a*) The Primary Stage—classes I--IV inclusive ;

(*b*) The Middle Stage—classes V—VIII inclusive ;

(*c*) The High School Stage—classes IX and X ;

(*d*) The Intermediate Stage—classes XI and XII ;

(*e*) The University Stage—a 2 year course for a Degree.

In both schemes of organisation the total course, in so far as it leads to a University Degree covers 14 years ; and in both the lowest age of admission to class I is presumed to be about five. We are aware that at present classes I to VIII are in some provinces regarded as classes I to IX, and that there are other differences peculiar to each province. Moreover, the various provinces do not, we understand, adopt precisely the same attitude towards the detailed framework of the proposed new organization. But for the purpose of understanding our terms of reference the classifications and contrasts outlined above will serve.

In view of the importance of a sound general education on which to base vocational education we have regarded it as within our terms of reference to report briefly upon the primary, middle, and high schools and also upon the training of teachers and the administration and inspection of schools. The main part of our report, that is the part dealing with vocational education, is the work of one of us (Abbott), while the section on general education and administration has been written by the other (Wood). Although we are in general agreement with one another, and when writing in the first person have used the pronoun " we ", each of us is responsible for his own contribution alone.

We wish at once to say that, though we regard reform of the content of general education as being even more important than a reorganisation of the framework of the educational system, we whole-heartedly commend the general layout of the proposed reconstruction. That is to say we think (*a*) that the Universities should make themselves responsible for a three year course leading to a first degree, and (*b*) that the system of general education below the universities should be divided into three well defined stages. This would ultimately involve abandoning the present administratively troublesome, and educationally ineffective, system whereby intermediate colleges or classes are sometimes part of an instituti on which is in fact a school, sometimes part of a university college and sometimes indeed isolated institutions providing a two year course.

We wish to record the fact that we have seen some schools, both general and vocational, of all grades in each of the three provinces which would stand comparison with good schools to be found in England and elsewhere. Our

critical survey of education is not, however, intended to be an essay in comparison. Conditions in India differ so markedly from those in Europe that an attempt at a comparative assessment would not, we believe, serve any useful purpose. There are, however, certain fundamental principles of education which are the basis of good practice wherever it be found, and if in the following pages we draw upon our experience of schools in Europe, it will be in elucidation of such principles rather than with the intention of measuring the schools of one country against those of another.

It is true that we urge that some of the key people engaged in educational work in India should pay systematic visits abroad in order to study foreign practice. But this is because we know that the surest stimulus to better work that a teacher, inspector or administrator, no matter where he comes from, can experience, is to witness, and to make an attempt to understand, the practice of other craftsmen. It is true, too, that we recommend that the initial direction of a certain new type of school should be in the hands of someone specially engaged from England. But this is because we believe that there is at present a dearth in India and elsewhere of teachers with the technical qualifications and the experience necessary to create this particular type of institution.

One of the reasons for instituting this inquiry into the educational system of India, and particularly into the relationship between the content and method of education and the requirements of industry and commerce, is the fact that a large number of university graduates are not securing employment, or employment of a kind for which their education qualifies them. On this aspect of the problem we may remark that it would not affect unemployment, considered as a quantitative problem, to divert students from universities into other educational institutions regardless of whether the students from these other institutions were likely to be more successful in obtaining employment than are the B.A's. and B.Sc's. Such a policy would but alter the educational qualifications of the unemployed without decreasing their number. It is important to make this clear and to avoid encouraging the delusion that a quick solution of the problem of unemployment is to be found in a reconstruction of the educational system.

The immediate purpose of education in relation to industry is to secure to industry the services of better qualified men, an achievement which does not by itself and at once result in more employment. The long range relation of education to industry is another matter. An improvement in the content and method of education will make for steadily increasing efficiency in industry and will contribute to its expansion; it should also generate new ideas and result in pioneer activities in the sphere of business. But the development of industry on a scale which will offer profitable employment to any substantial number of those who are now idle also depends upon the natural resources of the country, climatic conditions and a number of other factors which education cannot influence, as well as upon action in the field of economics and politics which do not come within our terms of reference.

The present issue is whether industry and commerce can look to the educational system for a regular supply of young people qualified to play their part and to earn a reasonable livelihood in the various grades of work into

which business naturally divides itself. The more efficient the supply the greater the possibility of industrial expansion ; but to create a supply out of all proportion to the demand would not only result in a waste of money and effort, it would disappoint many of those who had been specially trained, and could, thus, not fail to add to the general unrest.

We must emphasise that our report is based on a study of three provinces only. It would be cumbersome for us constantly to repeat this, but it should be clearly understood that, so far as we are concerned, our criticisms and our recommendations relate to Delhi, the Punjab and the United Provinces. It is not for us to say whether they are of significance to the provinces which we have not visited, and with whose educational provision and local problems we are therefore unfamiliar.

Before proceeding further we wish to express our deep gratitude to all those who have helped us with our task. In particular we are indebted to Mr. J. E. Parkinson, Commissioner for Education with the Government of India whose advice and, if we may say so, friendship have been invaluable to us at every stage of our inquiry. We have also immensely appreciated the unfailing help given to us, sometimes at great inconvenience to themselves, by Mr. W. H. F. Armstrong, Director of Public Instruction in the Punjab, of Mr. R. S. Weir, Director of Public Instruction in the United Provinces, Rai Bahadur Ram Lal, Director of Industries in the Punjab, Mr. H. B. Hudlikar, Deputy Director of Industries in the United Provinces, Mr. J. G. Cowie, Inspector of Industrial Schools in the Punjab and Mr. J. C. Chatterjee, Superintendent of Education in the Province of Delhi. There are many others we could name whose help has been invaluable to us, but space forbids any further detailed acknowledgment of our indebtedness.

*May 1937,* A. ABBOTT.

S. H. WOOD.

# PART I.

## General Education and Administration.

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# CHAPTER I.

## The Primary School.

1. We begin with an examination of the education of infants, a field in which India appears to us to labour under a very grave handicap.

### *Infant education and women teachers.*

2. In India there are millions of boys, as well as a number of girls, between the ages of 5 and 7 whose education is wholly entrusted to men. We said in our introduction to this Report that we were not concerned to make comparisons between the schools of one country and those of another. But as we come from a country which refuses to recognise the employment of male teachers in publicly provided or aided infant shcools we should be shirking our responsibilities if we did not say that experience of Indian practice came to us as a shock.

3. It is common for teachers and others concerned with modern educational practice to hold the following views :

(*a*) that the education of young children should provide not only for their formal instruction in such things as reading, writing and number, but also for their physical care, for training them in good habits and for widening their experience through interesting activities ;

(*b*) that in general women have a wider sympathy with young children and a deeper understanding of their needs and interests than men have ; and

(*c*) that, in consequence, women are better fitted than men to undertake the school education of children up to, say, 7 years of age, irrespective of whether the children are boys or girls.

4. We have hitherto regarded these as sound doctrines and nothing we have seen in India leads us to change our view. We are therefore of opinion that until a system of infant classes staffed by trained women is established in India education will remain unsound at its very foundations.

5. We are aware of the many, and some of them almost insuperable difficulties which stand in the path of this reform, but to despair of overcoming them would mean to acquiesee in a state of affairs which no one who has the welfare of young children at heart ought to accept as permanent.

6. We have seen many modest experiments designed to make some immediate contribution to the problem, such for instance, as a school for the training of the wives of village schoolmasters, and another for the training of Hindu widows. Every effort of this kind, no matter how small or how experimental, should be encouraged. The provincial governments might indeed be more active and more imaginative in their efforts, to secure a supply of trained women teachers for the infants in boys' schools. Even if the difficulties attendant on their employment in the villages are great, considerable progress might be made in urban areas where women teachers can live under the protection of their families.

*The Education of Girls and Women.*

7. We make no attempt to survey either the general education of girls and women nor the possibilities of vocational education for them. Such a survey, particularly because of the system of "purdah", could be made only by women. But we have seen a number of girls' schools and have been impressed with the liveliness and spontaneity of some of them. In particular. having seen infant classes, which include a number of little boys, in girls' schools in the hands of trained women teachers we are fully persuaded that young Indian women, like women in other countries have the competence, the sympathy and the understanding necessary for the education of young children.

8. In any case it is extremely important for India to concentrate on the education of girls and women. It is desirable in the interests of women themselves and because educated mothers may be expected to care about the education of their children. It is necessary because of the demand for women teachers, doctors and social workers. It is also of great significance because educated women are one of the most powerful factors in civilizing men ; and it is sometimes the manners of men which make the employment of women in schools and elsewhere so hazardous an undertaking, particularly in rural areas.

9. We say no more about the education of women ; but we trust that what we have said is clear evidence of our conviction that its further development demands urgent attention from governments and local authorities.

*The Nature of Young Children.*

10. Indian children, like other children, have feelings and experience emotions. Like other children, too, they are by nature playful in spirit, intellectually curious and physically active. This is true even though disease, malnutrition or social or religious custom may reduce or mask the spontaneous expression of characteristics typical of the young. The education of infants should not take mere casual account of these phenomena of growth but be based upon them and bring them under disciplines which will result in the children's enlightenment, health and happiness. It is vitally important that young children should not be required to sit still for long periods at a time. A young child needs rest it is true, but he must play, he must explore and he must be physically active if he is to derive a daily satisfaction out of his attendance at school. In short he needs experience more than instruction. It is no answer to reply, even if the statement be true, that the child has ample opportunity for play, exploration and physical activity out of shcool hours. That is to misconceive the nature of a child's growth and incidentally to undermine intelligent co-operation between home and school.

11. We are convinced that, with the notable exception of a fee schools, children in the infant classes in India spend too much of their school day in immobile "study" That is to say that they spend too much time sitting down with books, pens and pencils. In one school, taken at random the proportion of time for children of Class I allocated between physically inactive work and physically active work (counting clay modelling as physically active) was as 4 to 1. We do not say that this could not be matched in schools in other countries,

but that does not alter the fact that it is thoroughly bad educational practice. Among other things it must hamper the physical development of children; and schools cannot afford, least of all in rural India, to lay themselves open to the charge by parents—a charge which in fact is frequently made—that they produce physical weaklings.

*Concentration on Literacy a Mistake.*

12. It has been impressed on us from many quarters that the main purpose of primary education is to secure permanent literacy. We regard this as an unbalanced view of the purpose of education at any stage; and even if we accepted it we could not subscribe to the present method of attempting to secure literacy. Literacy, like happiness, is not achieved by pursuing it as a narrow objective; it is a bye-product of satisfying activities. Literacy does not consist in reading and writing but in the use of reading and writing, and, it may be added, of speaking and listening. A child will not master these simple skills nor form the habit of using them unless they are required for purposes which are significant to him rather than to his teacher. Conning books, learning by heart, and chanting in unison, have their legitimate place in the disciplines of learing but they do not by themselves constitute an education for young children.

13. It is no surprise to discover that this concentration at the infant stage on literacy as the goal of schooling finds its natural expression in the worship of literary facility at the higher stages of education. If the seed is sown in the infant school it is idle to complain of the fruit as it ripens in the university.

*A Suitable Curriculum for Infants.*

14. It would require a woman experienced in good infant school practice to make detailed suggestions for the training of children so young as the majority of those in Classes I and II. We can only broadly outline some of the studies and activities which we have in mind. In the first place necessary domestic duties should be brought within the child's daily training in orderly and hygienic habits. There must of course be formal instruction, and even drill, in reading, writing and speaking; and in counting and reckoning in numbers. But such instruction and drill should be for short periods and should be interspersed with opportunities for the use of these skills in activities which satisfy the child's wider interests. We envisage such activities as the following: acting and singing, physical exercises, games and dancing; nature study and the care for flowers and, it may be, animals; drawing and making things. These activities minister to one or other of the characteristic needs of children and provide them with experience which gives them confidence in their growing powers. Literacy comes incidentally as a child finds that he uses his knowledge of simple number relations or his ability to speak, read or write in the process of doing day by day something which gives him satisfaction.

15. Within commonsense limits, the smaller the child the bigger the materials he needs for expressing himself to his satisfaction. For instance, the infant does not as a rule get so much pleasure out of a pointed pencil and fine paper as from thick chalks or powdered paint for use on large sheets or rough paper, on the floor or on wall blackboards. The same principle applies to stories

and games for young children which should be generous in conception. Movement, colour, contrasts and the fundamental emotions are the things which appeal to them and which give them experience.

16. It may be objected that activities of the kind described produce a mess and give the school an appearance of disorder. The answer is that cleaning up is a proper part of training children in orderly habits, and that a continuous passion for tidiness on the part of a teacher is not compatible with good infant school practice.

*Wastage, Stagnation and Boredom.*

17. " Wastage ", so fully revealed by statistics, is no doubt partly due to parents withdrawing their children from school because they want them for work in the fields or at home. " Stagnation ", of which we also hear a great deal, is of course partly due to the dullness of some of the children. But, in our view both are to a considerable extent a result of the fact that so many of the children are frankly bored by the activities, or rather the inactivity, offered to them in the schools.

*The School as a Crêche.*

18. We hear complaints that the infant school is frequently treated as a crêche. Mothers send their children to school in order to get them out of the way with some assurance that they will be looked after. They withdraw them as soon as they find a domestic or economic use for them. This is of course disappointing to teachers and exasperating to those who see public money expended on children whose attendance at school is negligible from the point of view of achieving literacy. But is not this really the schools' great opportunity ? Good infant schools *are* places where, among other things, children are looked after, where they are given opportunities to be active without getting into mischief. Mothers are right in seeing the school in this light ; and it is the school's business to build on it and do more for the children than mothers reckon on. But this *more* must not, as we have already said, take the form of inactivity such as can only make the children listless, restless or troublesome when they get home. When a normal child hails his release from school at the end of the day either with shouts and horse play or with a listless apathy it is fairly certain that he has been ill occupied during school hours. If an appreciation of, rather than a prejudice against, education, is to find its way into the homes of rural India, the infant schools must be sensible, happy institutions which patently do something for the children which the home does not do but yet which the parents appreciate when it is done.

19. We have seen schools in India in which the activities of the children *are* based on such consideration as we have enunciated, and they are happy places. But it general the primary schools are not alive and are altogether too solemn. Little children and continuous solemnity go ill together.

20. It is easy to prescribe a sensible scheme of training on paper, but difficult day by day to minister to the needs of children in the flesh—some tired some dull, some undernourished, and some recalcitrant. It would ill become us to minimize the difficulties of the task. We can but point to the need for

women teachers, and apart from this, to the importance of a system of training for infant teachers which is based on the real needs of young children.

21. We need not pursue in detail this analysis of the school day in the primary schools. The work of children in classes III and IV should be adapted to the increasing capacities and interests of the children, but it should be based on the fact that children of eight, nine and ten years of age are growing rapidly in body, mind and spirit, and that it is the function of the school at this stage to minister to that growth by enriching experience through activities as well as by book learning.

## CHAPTER II.

### The Middle School.

22. By the time children reach the middle school, or as it would be called under the new organization, the lower Secondary School, they should possess, among other things, a knowledge of their own language, written and spoken, which will enable them to use it for the expression of their own ideas and for their further instruction. That it what literacy means, and we need not labour the point that that is what we believe would more often be achieved if, during the first four years of school life, there were less concentration on language for its own sake and more on its acquisition for the satisfaction of the child's own interests.

*The Rural Middle School.*

23. We devote ourselves, in this chapter, more particularly to the rural middle school because we regard it as potentially the most significant educational institution in a country in which about 90 per cent. of the population live in rural areas. There is little hope of permanently improving the conditions of village life and of making the rural population responsive to fruitful ideas unless the younger generation is educated beyond the primary stage up to an age when boys and girls realize that they are becoming social and economic assets to the community.

24. It is not the duty of the rural teacher to plan his work with the intention of anchoring every child to the soil. A pamphlet* recently issued by the Board of Education says " the view that education is concerned with determining as distinct from revealing, what and where a child's future is to be is a dangerous one, and is likely to lead to restriction of variety of educational provision, and thus to set limits to the free development of the individual child's aptitude and interests " But the same document says, " neither cultural nor utilitarian needs can be met by an education which does not freely derive its content and its inspiration from the environment of the pupils " Some of the best schools we have seen in India are those which, eschewing the teaching of English, base their instruction and their activities on the environment of the children and on the natural and social phenomena with which they are familiar. Ideally, the village school as an instrument of education starts with an advantage over the urban school. Among other things, the problem, so actute in many

* Education and the Countryside. Published by H. M. Stationery Office. Price 1/6*d*.

town schools, of providing suitable activities for the child who has outgrown the simple processes appropriate to the infant stage but is not yet old enough to be entrusted with sharp and delicate tools or expensive material, is much more easily solved.

25. There is scarcely an activity (we prefer at this stage of education to continue the use of the word " activity " rather than the word " subject ") of the curriculum for children between say 9 and 14 which is not enriched by letting it arise out of rural life. To be more precise, a school in a rural area, with a garden or small farm attached, has very much greater opportunities for providing stimulating work and instruction in simple mathematics, nature study, science, geography and handwork than has an urban school. Its situation, moreover, unless it be starved of books and equipment, constitutes no bar to its also encouraging studies which do not arise out of environment; and of course it is the business of the school to widen horizons and to encourage an interest in things remote and unfamiliar.

26. We do not, however, envisage a school of this type as a vocational school for agriculture. It is true that most of the children despite the lure of urban life will, when they grow up, remain in the countryside but we are convinced that agriculture does not lend itself to narrow vocational treatment in middle schools. Agriculture is a way of life and not merely an occupation. It is unreasonable to ask the rural school to attempt to provide technical instruction in agricultural processes. These involve an appreciation of chemistry, physics and biology which is beyond boys of 14 years of age. The business of the middle school is to make the familiar instructive and to inculcate in the boys such an attitude towards knowledge and their environment that they may, as they get older, be willing to face new ideas and changing circumstances with intelligence and courage.

27. We should not express so firm a conviction about the potentialities of the rural school if we had not seen some, particularly in the Punjab, which are promising enough to justify it. If, as we are told, middle vernacular rural schools are dying out to give place to anglo-vernacular schools it is a sign of something very wrong with educational policy. For we have been told on several occasions—and our limited experience of the schools confirms the statement—that, in general, the village boys whose school days have not been hampered by the grind of learning English are more alive at the end of the middle stage, that is to say they are better educated, than their fellows of the same age in the anglo-vernacular schools.

### *Education and " Rural Uplift "*

28. It would obviously be an advantage to the community if rural schools generally became what a few of them now are centres of " rural uplift " (to use a phrase which we find is common in India), that is agencies for the propaganda of health, good habits, and an enlightened outlook on rural economy. But an undiscriminating mass policy designed to secure this would defeat its own end. It would inevitably burden a number of schoolmasters with responsibilities beyond their powers. The schools would deteriorate and " rural uplift " would be a fraud.

29. Many a village schoolmaster is ill-equipped and without professional or social status ; and he may be subjected to external influences which make dispassionate yet zealous work for his school and the village difficult to perform. If therefore, unaided, he assumes responsibility for activities outside his more narrow duties as a schoolmaster, his care and education of the children may suffer and the school may become a somewhat woolly centre of " village uplift without any solid work on which to base its external activities. This brings " village uplift " into disrepute and is unfair to the children whose health and education should be the first concern of the school.

30. Two conditions must be fulfilled if the school is to perform this dual function of educating the young and acting as a centre of " sweetness and light " for the community as a whole. The teacher's status in the village must be improved ; and this means better training, a reasonable and sure salary, and some guarantee, subject to good work performed, of security of tenure. The other condition is that there must be effective co-operation between the education service and the other services (health, co-operative movements, and so on) which concentrate on improving village life. The schools must not have tasks for the enlightenment of the adult community forced upon them and then be left alone to perform them. Unless the other services can provide some one of purpose who is in a position to give continuous aid to the school in the discharge of its wider activities, it were better that the school limited itself to its more modest, but always exacting, duty of educating children. To make good the wider activities of the schools demands a co-operation between services, from the top to the bottom, which does not yet exist.

*Co-operation between Education and other Services.*

31. We cannot work out in detail the co-operation required because we are not familiar with the central and local organizations of those other services which have the welfare of the rural community at heart. It is obvious, however, that the efforts of those other agencies are bound to be wasteful unless their seed is sown on fruitful ground, and the only fruitful ground is a physically responsive and educated community. In other words the education service, and the health service with which it ought always to be associated, should be recognized, and openly recognised, as the basic social services. The health service does not come within our province but we cannot refrain from saying that one of the crying needs of India is an effective school medical service.

*The Vernacular and English.*

32. The vernacular will of course be the medium of instruction throughout the lower secondary school stage. We are not competent to discuss the methods of teaching, or the literature of, the vernacular languages ; nor are we qualified to offer any advice on questions, which we know are exercising thoughtful people, about the relation of the various vernaculars and the possibility of using a basic script for some of them. We can only urge that the narrow study of language should not assume, at the primary and middle stages, such proportions as to deaden the school life of active young boys.

33. We deal with the general question of the study of English later on and we should not mention it here were it not for the fact that many parents demand it thus early because of the social and economic value of a knowledge

of the language which is current in the higher ranges of government service and business. The schools must serve, public needs, and the study of English, at least as an optional subject, may have to be included in the curriculum of some of the lower secondary schools where there is a public demand for it. We must however protest against an excess of language teaching at this early stage. An examination of the time tables for boys between say 10 and 14, who are learning English, in the provinces which we visited, reveals the fact that in many schools more than half the total number of teaching periods of the week are devoted to linguistic studies. In our view no social or economic consideration can justify such a misuse of educational opportunity.

*General.*

34. We said when dealing with infants that education should be for them a matter of gaining experience, and that it was colour, movement, contrasts and the emotions which appealed to them. If we were to define the corresponding interests of boys between say 10 and 14 we should say that they are interested in experiment or, as it has been well put, in " how things work " A small child is delighted that an engine moves ; an older boy wants to take the engine to pieces to put it together again and be able to say " I know how it works " And in the realm of natural phenomena a wealth of material is at hand for observation and simple experiment. Boys ought to understand, and they delight in understanding, how nature works. Sun, moon and stars, rain, hail and snow, clouds and winds, rivers and ponds, flowers, birds and other living creatures. How do they work ? Many of the basic truths about these things are not beyond the discovery and understanding of boys, and it should not be regarded as beyond the capacity of teachers to lead pupils in observations and investigations sufficient to satisfy their interests. Much of the equipment required for this kind of activity is comparatively slight and some of it can be made by the boys themselves.

35. This brief survey of the middle school has dealt with principles rather than with the details of the curriculum. If it has not suggested the range of knowledge of the usual school subjects which is generally expected of boys at this stage, there are good reasons for the omission. We regard the acquisition of simple skills, including of course, reading, writing, speaking and listening, and the power to use them as instruments for obtaining fruther knowledge and experience as more important, at this stage, then knowledge itself. A boy's ability to understand what other people say and write and his power to express himself are more significant than his capacity to absorb information. Finally we have no fear that, even if we have neglected to indicate its range there will be any dearth of class room instruction in subjects such as history geography, science and mathematics. Our object has been not to decry instruction but to plead for the inclusion of activity as part of the educational process, in the conviction that for boys of this age " doing " is the beginning of " learning"

## CHAPTER III.

### THE HIGH SCHOOL.

36. It is a commonplace to say that the High Schools of India are examination-ridden and that teachers and pupils alike are too dependent on text books.

The Higher Secondary Schools will have to improve on the spirit and the methods of the existing High Schools if educational reconstruction is to mean anything more than a mere change of names. An educational institution intended to launch boys of, say, 17 years of age on the world at large must be designed to be more than a mere ante-room to the University.

37. The Higher Secondary Schools should not only instruct boys but also train them how to study, in the hope that they may remain mentally alert and continue the pursuit of intellectual interests after they leave school. It should give them experience of managing their own affairs corporately and so develop in them a sense of social responsibility. It should also offer each boy the opportunity of acquiring, through work of a definitely individual character, a reasonable independence of his fellows. These things are not achieved merely through classroom instruction, work in science laboratories and participation in games. The school should have a well-stocked library and rooms for creative activities, such as manual work and art. The boys should be encouraged to play a predominant part in organising their own societies and in planning activities outside the normal work of the class-room and the laboratory. A good school will also cultivate a close relationship with parents through parents' associations or in other ways. Parents have a right to be interested in institutions which purport to educate their children. We have seen a few High Schools which strive after these things, but our impression of them as a whole justifies the condemnation with which we opened this chapter.

*Conditions of Recognition of Higher Secondary Schools.*

38. In our view there are more high schools and intermediate colleges purporting to give, and aided for the purpose of giving, an education suitable for boys of 15, 16, 17 and 18 years of age, than do in fact give it. Some of them because of inadequacy of space, buildings and equipment, and some because of their lack of teaching power cannot perform the task they are supposed to perform. Moreover, we are of opinion that if the universities were austerely administered many of those who now secure admission to degree courses would fail to do so. The fact is that the absence of prospects of suitable employment for many of those who complete the present high school course leads parents, in despair, to look to the university for the further education of boys whose abilities and talents do not qualify them to profit by instruction of the kind which universities ought to provide. The universities on their side, partly owing to public pressure and partly because of the advantages to be derived from a substantial income from fees, fail to maintain strict university standards.

39. We are of opinion that each provincial government should make itself responsible for the effectiveness of the provision of higher secondary schools in its province. By this we do not mean that only the government should provide such schools ; but we do mean that by their provision they should set a standard, and that by comprehensive and regular inspection they should insist on that standard being consistently maintained by others.

40. Any school seeking recognition and aid as a Higher Secondary School should satisfy government on at least the four following points

(*a*) that having regard to the approved provision already in existence the school is necessary to meet the needs of the area (or in special cases, it may be, the needs of the religious community) which it is intended to serve,

(*b*) that its buildings, equipment and playing fields are adequate,

(*c*) that its teaching staff taken as a whole is, from the point of view of numbers, attainments, and experience, sufficient to shoulder the responsibilities of educating boys from 15 to 18 years of age, and

(*d*) that the financial position of the school is such that it can be counted upon to be a permanent contribution to the provision of the area, and, with government aid, to pay its teachers on a salary scale approved by government.

41. We realise that certain anomalies requiring patient adjustment will arise. Tidy administration is not always good administration ; good administrative practice puts the actual needs of the situation before cut and dried regulations. There is, however, no doubt that compliance with these conditions would result in some of the existing high schools changing their status and of course the intermediate colleges as such would in any case disappear under the proposed reorganization. This may cause some heartburning to those who now provide high schools and intermediate colleges. But if the educational welfare of the people be accepted as the standard of concern, and if the importance of the lower secondary school be fully appreciated, is it too much to hope that each voluntary body will be willing, with grace, to make its contribution, to the whole system, realizing that it has a significant part to play even though it be not the part it would have chosen to play ?

42. It is not for us to advise on the future of individual schools. Decisions on such issues (and we admit they will in some cases be very difficult to take) can be made only by the central authority for education in each province.

*English as a Medium of Instruction.*

43. Sooner or later in the course of the higher education of Indian boys the English language becomes not only a subject of study but the medium through which instruction is given in other subjects. This is indeed another great handicap from which the system of education in India suffers—the use, at some stage, of a language not native to the people as a medium for their education. At present English is used as such a medium in the high schools—that is for many boys of say 15 or 16 years of age ; though, fortunately, universities are increasingly allowing candidates at the matriculation examination the option of answering questions in the vernacular.

44. It is not possible accurately to assess the mental dislocation and the inhibitions which boys of say 16 years of age suffer from being required to give and receive information, to formulate ideas, to record their experiences and to express their sense of values in a language other than that which they use and have always been in the habit of using in domestic and social life.

Our experience of the high schools, limited as it is, persuades us that this use of English as the medium of instruction lies at the root of the ineffectiveness of many of them. As a whole the boys in the high schools are responsive and educable but they are hampered at every turn by having to handle an instrument which comes between them and spontaneity. Among other disadvantages the use of a foreign language as a medium of instruction for school boys both fetters the discretion of those who prescribe syllabuses and set and correct examination papers and forces undue reliance on text books by teachers and pupils alike, even to the point of encouraging the latter to memorize whole passages from them.

45. We would therefore urge that so far as possible the varnacular should be the medium of instruction throughout the higher secondary schools, leaving English to take its extremely important place as a compulsory first language. We know that this will present many difficulties and that no wholesale and immediate departure from present practice is possible. The number of vernaculars presents one difficulty and the comparative absence of text books and reference books in them is another. But these and other obstacles to a change would not be insuperable if once the principle were genuinely accepted—particularly as there appears to be general agreement that the technical terms in use in English scientific text books could be retained.

*The Teaching of English.*

46. It would be difficult to overemphasize the importance to the educated Indian of a good knowledge of English. It is absolutely necessary for those who will move in the world of business, and government. It is moreover the only common language to be found in India, however limited may be its distribution having regard to the millions who are illiterate and the many others whose language familiarity is inevitably confined to their own local vernacular. Further, English, is to an increasing extent, being spoken and understood by educated people all over the world. It is therefore pre-eminently the language which opens up prospects of employment at home and abroad and offers the means of cultural communication with other parts of the world. There is thus every justification for English being treated as a compulsory language in the Higher Secondary School.

47. The prime necessity however for pupils at this stage is for them to become familiar with English as it is written and spoken in everyday life and in the ordinary English speaking home. This is the kind of English they need ; and unless a boy's knowledge is of this character the language cannot possibly justify itself to him or his teachers as a medium of instruction in other subjects at the university stage. Moreover along no other road can anyone travel to an appreciation of the great works of English prose and poetry.

48. We connot therefore too strongly urge that the teaching of English should be simplified and, if we may so describe it, made more domestic. The repetition and critical study of difficulty English prose and subtle English poetry—works which would tax the appreciation of school boys in England —should not form so systematic a part of the instruction of boys in the higher secondary schools as it does at present in the high schools. Teachers should bear in mind that the average boy of 15 or 16 years of age likes, and learns more from, a straightforward story or a book which describes interesting

people or records interesting events than from essays on abstract subjects or the finer flights of poetry.

49. Incidentally we may mention another though not so important an aspect of the problem. The teaching of English in Indian schools is in the hands of teachers, the great majority of whom have naturally had no opportunity of visiting England or any country in which English is the native language ; and they themselves may have been taught by others who also lacked that experience. The result is that there is current in many schools an English which is Indianised in pronunciation and intonation, and which therefore fails accurately to convey the genius of the language.

50. What is needed in the schools of young men are to move with comparative ease in walks of live in which English is the medium of conversation is slower and better articulated speech, training in the art of listening, and if possible, more opportunities of hearing English spoken by English people. If those English men and women who have the time to spare would place themselves at the disposal of the schools for conversational purposes great benefit would result to the pupils. This proposal would require good will on the part of all concerned and careful organization, but it would not demand of those who offered their services any particular teaching ability.

51. We do not make these criticisms and suggestions without a very careful assessment of our short experience in India. We have been in more than one classroom in which it has taken us some time to realize that the teacher was using English as the medium of instruction. We have asked questions of boys who were being instructed through the medium of English and have been forced to the conclusion that some of them seem to assume from the beginning that they will not be able to understand a question asked in English by an Englishman. When they do understand and prepare to reply in English it is too often as though they were struggling with an instrument with whose intricate shape they were familiar but whose use for simple conversational purposes they had not sufficiently practised.

52. We are far from saying that there are not boys in the high schools whose maturity of mind and grasp of the language justify the pursuit of more advanced studies in English. We were, indeed, impressed by the few boys who stood out conspicuously among their fellows in this respect ; and, of course, staffing ought to be generous enough and time tables elastic enough to make special provision for them. But the normal boy ought to devote more of his time to work-a-day English and less to Shakespeare, Shelley and Macaulay. We would therefore suggest that even if set books in English are prescribed as an optional study for the examination to be held at the end of the higher secondary school course, the compulsory examination in English should mainly consist, apart from any oral test, of an essay and an exercise in précis writing. These would test the boys' power to express his own thoughts in English and his ability to understand and put into his own words what other people have said or written. These are the tests of familiarity with a language and, moreover, they lend themselves much less to cramming than do set books, which is no small advantage.

53. We are aware that the logical thing for some schools is to provide for the study of English at the very beginning of school life. This is done in those

schools, whose children for the most part, come from homes where English is normally spoken, and are, in any case, likely to be prepared for positions of responsibility in government or business. But no one knows which of the children in an ordinary primary or middle school will ultimately wish to qualify for admission to a university or to enter upon a career in which English is a necessity. And it is quite out of the question to burden the millions with an early study of English for the sake of catching the few to whom it may be an advantage.

## CHAPTER IV.

### Manual Work, Art and Physical Education.

54. We devote a separate chapter to some activities of the curriculum because what we have to say about them concerns primary, middle and high school education which we have already surveyed in chapters one, two and three respectively.

*Manual Work.*

55. It is often said that the Indian boy will not take off his coat and do a "job of work" with his hands. Manual work is undignified or worse. There are, sometimes, social reasons to account for this attitude, and it is of course one of the functions of education to overcome prejudices inimical to the welfare of society. But it seems probable that some of the disinclination to do manual work is due not to any traditional custom but to the fact that until recently boys have been starved, from the very beginning of their school days, of the satisfaction which come from manual activities. Fortunately manual work is now finding its place in the schools, though many boys are still deprived of its advantages. In some, but not many, schools it has developed in such a way that the workshop has become a place to which boys resort to carry out their own constructive ideas. Of course syllabuses are desirable in craft work as in other activities of the curriculum, and formal exercises are also necessary. But uniformity can be overdone. There are instructors in the schools who are capable of working out their own schemes and they ought to be encouraged to do so ; and some of them might well give the more responsible and skilful boys much greater freedom than is, in fact, given at present.

56. Manual activities should find a place in the curriculum not because the pupils of some of them will earn a living by manual labour, but because satisfaction of the desire to make or create is necessary to balanced development. It is, indeed, often the key to a boy's serenity. Not every boy enjoys manual work or is competent at it, but the same is true of other subjects ', such as mathematics and languages which are nevertheless taken for granted as part of the curriculum.

57. Manual or constructive work is educative while it is being planned and at the actual moment of execution. It is valuable for other reasons. It may lead pupils to acquire interests which will stand them in good stead in their leisure hours ; and the importance of education as a means of enabling young men to sustain with dignity the intolerable leisure known as unemployment cannot be over-stated. Moreover, manual work gives boys a handiness,

invaluable to those who proceed from general to vocational schools—a consideration which is of great importance in the light of our investigation.

58. We must make it clear that we use the phrase manual work for convenience. In earlier days it was called " hand and eye " training. In any case we do not mean just carpentry or weaving or any other activity to which a definite name can be given. We include any task which makes a demand on a boy's skill, judgment, sense of observation and power of calculation, and combines all or some of these in a constructive effort to achieve an end which he himself wishes to achieve. The end may be making something he wishes to possess or to give to others or it may be working out in concrete material some principle in mathematics, science or geography. It is not so much the thing made or done as the integration required in the making or doing which is of educational value. Many boys who have been labelled " dull and backward " have revealed unsuspected executive abilities when the emphasis of their training has been shifted from learning to doing.

59. We deal with Art separately but it is obvious that the relationship between a boy's manual activities and his appreciation of colour, form and design will be sincere only if the teachers of manual work and art co-operate with one another.

*Art.*

60. We have already mentioned the desirability of giving infants opportunities of expressing themselves by drawing and painting particularly, in colour, and through the medium of plastic material. Such activities are a release to the children from formal instruction and minister to the development of their individuality. They involve the use of the hands ; they bring observation, memory and imagination into play and they make possible the beginning of a cultivation of taste. It is not necessary to have an artist to supervise the work of young children. What they need is sensible guidance and encouragement so as to give them confidence, but otherwise to be left reasonably alone to express themselves in their own way.

61. Very young children can produce attractive imaginative pictures and simple craft work of a kind which gives them great pleasure and satisfaction. We have been convincing proof of this in those Primary Schools in which the teachers believe in the enterprise and sincerity of the children and give opportunities for their exercise. But we have also seen a great deal of work which amounted to little more than tracing or copying the drawings of others. Children may reasonably trace or copy a map if it is required by them for geographical purposes, but there is little value in young children tracing or copying some one else's drawing of a camel or a tree. Similarly there is some point in using a mould for making something which must be of mathematical proportions because it is to fit into some other structure. But it is a waste of opportunity to ask children to make an elephant from a mould when there is material available for each child to fashion his own elephant. Moreover, drawing an object from sight is seldom a useful exercise for very young children. If infants are to learn how to use and to enjoy controlling tools and material they must, to begin with, be allowed freely to draw or make from memory and from imagination.

62. Draughtsmanship and the desire to become proficient in design and crafts comes later. As they grow up children are not satisfied merely to express their own ideas without relation to any standards. They begin to appreciate the work of others and to care about the level of execution of their own work ; and their education should, therefore, take the form of a training in taste and appreciation as well as a discipline in the honest representation of their immature ideas. If, at the middle school stage, art is closely related to a boy's craft work he becomes critical or appreciative, as the case may be, of his surroundings, including his school, the furniture and ornaments in his home, sign writing in public places and the design and decoration of buildings. He begins to understand that good craftsmanship is not merely a question of skill of hand but involves appreciation of the nature of material and of design and the power to give form to images of beauty.

63. We have seen some sensible art teaching in High Schools and Schools of equivalent rank, but on the whole there appears to be a dearth of constructive and critical teaching of the adolescent, and an absence of any conscious relationship between what a boy does during the time he devotes to art as a subject of the curriculum and the remainder of his school activities. Art should not be thrown into the curriculum as a concession to sentiment but should claim its place as a necessary part of each boy's education in the humanities and because the school as a social institution ought to aim at an honest appreciation of aesthetic value in life.

64. It will not be sufficient merely to provide time, space and equipment for Art in the new Higher Secondary Schools. Plans must be made to secure what at present is so patently lacking, namely a supply of teachers whose artistic training and powers of execution qualify them to instruct and criticize as well as to encourage. The importance of this can scarcely be overrated. India, with all its history of artistic achievement, is not doing what it might, through its schools, either to foster among the people generally a concern for aesthetic values or to discover the individual talent which, if properly nurtured, would enrich the country's indigenous art.

*Physical Education.*

65. The technical health services do not come within our province, though as we have already remarked one of the greatest needs in India is a school medical service. It is pitiable to see children in schools, sometimes a great many of them, suffering from ailments which, if they had been detected early and treated, could have been cured. But we are concerned, here, with the layman's contribution to health—what may be called physical education. We have seen some exceedingly good physical training—vigorous and effective —and we wish to pay a tribute to the influence of the scout movement on the development of physical education, particularly in the Punjab. But physical education does not consist solely of physical training in the formal sense.

66. Physical education begins in the classroom where children spend most of the day ; and the basis of it is cleanliness of person, hygienic classroom habits, good ventilation, and frequent opportunities for movement, especially for young children. A large number of schools in India—village schools and urban schools—have attractive and spacious playgrounds ; and they are increasingly used not merely for formal physical training but also for organized games.

We could wish however that the playground were more often used for even less formal recreative purposes. Children need frequent changes from classroom work, which involves so much comparative immobility ; they need spells of five minutes or so when they can stretch their limbs and enjoy some free spontaneous movement. It is not a question of having one recess in the morning and one in the afternoon, when all the children are free to use the playground. It is the problem of a carefully thought out programme to ensure that the outdoor " recreation room " is in constant use for recreative purposes, including, it may be, classroom instruction out of doors. This of course is subject to reasonable outdoor weather conditions, of which in Northern India there is fortunately such a blessed profusion for many months of the year.

67. A distressingly large number of the children in India are ill nourished. This is a good reason for being discriminating in selecting those who shall engage in vigorous physical exercises, but it is no justification for keeping any children in a sitting position for such long periods as are customary. On the contrary, the ill nourished require change of posture and recreation as much as any one else. It should also be remembered that physical education is concerned with poise, rhythm and control as well as with muscular development and that it is a useful personal discipline for young children to be required to leave their classrooms quietly—possibly, if it cannot be avoided, to pass through another classroom with a minimum of disturbance—in order to have a few minutes of physical recreation or relaxation before returning in an orderly manner to their more sedentary occupations. The quickened intellectual response to instruction compensates for the curtailing, by a few minutes, of the time devoted to formal lessons and is a good return for all the trouble which the organization of such recreative periods admittedly involves. We have already said that the infant classes in the Primary Schools are too solemn. One way of allowing a little joy to break up that solemnity is to give the children frequent opportunities of satisfying their perfectly natural desire for physical play.

## CHAPTER V.

### The Training of Teachers.

68. The key to educational reform is to be found in the training of teachers and in the critical but sympathetic and stimulating inspection of the schools. For work in Primary and Middle Schools, with which we are here mainly concerned, we are of opinion that the training of teachers should consist of two distinct parts. First, a pre-employment training of students in Normal Schools and later refresher courses for practising teachers who have had some years' experience of their craft. The second part of training has not been developed in India to the extent which the conditions of the life and the service of teachers, particularly of rural teachers, demand.

69. If one asks the Heads of Normal Schools how they think their students will be fairing after say three or four years of actual experience of teaching in village schools, one is likely to get an answer which suggests that many, if not most, of them will have lost their enthusiasm and succumbed to the depressing conditions under which they have to do their work.

70. The village teacher may be single-handed. (There are 9,000 single teacher schools in the provinces which we visited). He may have to work in quite unsuitable and overcrowded premises, he may be faced with the complete indifference of parents and neighbours and he may even be subjected to political or other pressure which, if he does not bow to it, will threaten his security of tenure. The head teacher, if there is one, may be unsympathetic, and the children whom he has to teach may be apathetic, troublesome or irregular in their attendance, because of disease or ill-nourishment or from other causes. Moreover, though the teacher may not relish inspection, he will probably not experience enough of it, nor may it be of a kind, to act as a stimulus to the efficient discharge of his duties day by day. Finally, he may be ill-paid and lack the status in the community which his vocation merits. This is a gloomy picture, and of course it is not true of all village teachers. It applies, however, to a great many of them.

71. In these circumstances the Normal School ought, in addition to training the intending teacher in the technical arts of his craft, to attempt to do something to give him " staying power " It ought to aim at fortifying him against disappointment and giving him the spirit to withstand temptations to slackness, so that he may keep his head above water during his early years in the profession. This means, if we may so put it, that the Normal School should concern itself with the social " why " of education as well as with the technical " how " of teaching. If a teacher appreciates his task as an educator and realises the significance of the school in the life of the community he may become proud of his vocation and resist temptations to bring discredit upon it.

72. We are aware that such a view of the training of teachers may be interpreted as encouraging the provision of academic lectures on the history of education, sociology, psychology and ethics. Such academic instruction would be inappropriate in the Normal Schools if only because of the meagre academic qualifications required for admission. But, even so, these young teachers should know something of the history of their own country and its educational effort, should make some attempt to grasp the social problems of the local communities which they will serve, and should be encouraged to understand the nature and the needs of young children as well as the technique of instructing them. Further, students in Normal Schools should, if possible, derive from their training some principles and motives which will encourage them to take an ethical view of their vocation.

73. We should not expound this view of the function of the Normal School if we had not been encouraged by seeing it worked out, at any rate in part, in one or two of the existing institutions. In these Normal Schools there is an attempt to develop the cultural and sociological experience of the students as well as to give them sound instruction and practice in the arts of teaching.

74. Unfortunately there is a grave defect of general organization which must hamper the Normal Schools in their task. The educational qualification required for admission to a Normal School is the satisfactory completion of the middle school course. This is a very meagre qualification but in present circumstances it is not reasonable to demand more. The lowest age of admission to the Normal School is, however, a year or two in advance of the age at which an intelligent boy would complete the middle school course. There is thus a gap during which some boys, having no defined course to follow, may be lost

to the profession or spend their time, until they are old enough to enter the Normal School, unprofitably. We realize that 14 or 15 years of age—the ages at which normally intelligent boys pass out of the middle school—is very early to commit anyone to teaching as a profession. But in present circumstances we think that the future teachers in primary and lower secondary schools should be " caught " then ; and instead of being given a comparatively short course a year or two later should at once be admitted to a vocational course of at least three years duration. In other words the lowest age of admission to the Normal Schools should be the age at which the ordinary boy would complete the middle (or lower secondary) school course ; and the length of course in the Normal School should be at least three years.

75. Such a course would enable provision to be made not only for technical training in teaching but also for a continuation of the student's general education. It would also give more time for the kind of training, some constituents of which we have already indicated, which in India and elsewhere is so frequently described as " character training " It is easy to talk of character training but very difficult to provide it. It is possible only if the institution, whether it be a Normal School or any other type of school, becomes an organic society whose health depends upon the behavior of those who compose it. It is not sufficient, as so often seems to be assumed, that there should be a wholesome team spirit inculcated by games and other physical activities. There must be a conviction on the part of teachers and students that the social and intellectual life of the society flourishes when individuals behave with courtesy, generosity and courage and wilts under pettiness, jealousy and intrigue.

76. It may be argued that the teacher of little boys of from 5 to 8 years of age does not need for teaching purposes the more or less extensive general education which he would acquire in three years. Such an argument must be resisted. The Primary Teacher may not require it as a narrow teaching equipment but he does require it for broad professional purposes. The teacher whether he be in a High School or an Infant School, belongs to a distinguished and honourable profession, and everything that can be done should be done to give him an education which may lead him to intellectual or cultural interests outside the narrow range of his teaching and may provide him with a status in the community of which he may legitimately be proud.

### *Refresher Courses.*

77. If the spirit of those who have had some training before entering upon their work is to be kept alive and if their technical skill as teachers is to be improved it is vital that they should have opportunities from time to time to attend refresher courses. Many a young teacher finds by bitter experience that an isolated school to which no one pays any friendly attention is a very different thing from the practising school in which he first displayed his teaching skill under the guidance of sympathetic tutors. He may find too that life in the village is dull and unenterprising compared with that which he lived with congenial fellow students in the Normal School. After a few years the first flush of enthusiasm may wane. Even if he does not become slack and indifferent he may begin to fall back on the first resort of the teacher on

the down-grade—occupy the stage himself to the exclusion of active work by the children ; or sink to the last resort—the constant use of the stick. He may, in short, lose the staying power to which we have already referred.

78. A refresher course may make all the difference to the morale of such a teacher. But such a course must not be narrowly conceived. It must bring him back to the company of fellow teachers of his own standing under social and domestic conditions which are attractive. It must also provide him with instruction by those whom he recognizes as superior to himself in the mastery of the craft which he practises. And it must recall him to a world wider than that of the school and so link him up again with the interests of society at large. This last point is very important ; and there must surely be in India people of goodwill and distinction, not directly connected with education, who would be willing to attend refresher courses for the purpose of living with teachers for a few days and talking to them about experiences and issues in a way which would release them from too narrow a concern with their own problems and relate them and their vocation to the world at large. This kind of instruction and stimulus, given after the teacher has been at work for a few years, is the other half of training.

79. The time may not yet be ripe for the logical out-come of this conception of the two-fold nature of the training of teachers. But in course of time there ought to be in each province a government training college comfortably housed, well equipped, and organized and staffed for the purpose of providing a sequence of refresher courses of one or two months duration throughout the year. Such courses would not replace local refresher courses. On the contrary the College would be the centre from which local courses would derive inspiration and practical help. The Principal of such a College should receive a salary and status commensurate with the importance of the institution, and his staff should always include a number of the best teachers and inspectors, who would be withdrawn, for a period from the field of school and inspection in order, as a distinction, to serve as instructors. Such a staff training college would not only keep a number of practising teachers educationally alive it would also invigorate the inspectorate.

## CHAPTER VI.

### Administration and Inspection.

80. The schools of India are not suspended in mid-air. They are borne on an administrative machine. It is not necessary for our purpose to describe in detail machinery which varies slightly from province to province. Broadly speaking it consists of the Minister of Education, the Secretary for Education, the Director of Public Instruction who may also be Under Secretary for Education, possibly a Deputy Director of Public Instruction, a corps of Inspectors and the usual minor personnel of a Government Department. It also consists, so far as the administration of some of the schools is concerned, of Municipal Boards and District Boards to whom the central governments have relinquished the control of Vernacular Education. There is also a statutory body known as the Board of High School and Intermediate Education which controls and conducts the examinations in High Schools and Intermediate Colleges

and has other functions in relation to them. We must also include within the administrative machine the committees or governing bodies which provide and maintain, with government aid, the many voluntary educational institutions. The area of each province is divided into circles or divisions, each of which is under the supervision of an inspector with a staff of subordinate inspectors to assist him. This is but a skeleton of the whole structure and it does not purport to be comprehensive. It does however show that the machine is complicated ; and it is but a platitude to say that the strength of the whole is the strength of its weakest part.

81. Educational reform depends primarily upon the spirit and the competence of the teachers ; but it is idle to hope for consistent improvement in the service of education as a whole unless administration is efficient. Two things at least are necessary if teachers are to be given a chance of doing a good work. There must be integrity of administration throughout and there must be continuity of educational policy.

82. It is clear to any close observer that, in India, decisions are too often taken and appointments and promotions too often made on grounds not concerned primarily with the welfare of the schools and of the children in them, but to placate or promote political, communal or family interests. We are not of course referring to action taken to implement the political programmes of parties which may reach power, nor to decisions taken in accordance with recognised agreements about such things, for instance, as communal quotas. Such programmes and such agreement may, sometimes, have unfortunate educational results but the decisions based on them are open and above board. We refer rather to the exercise of less legitimate communal, political or family influence.

83. It may be argued that minor officials or local bodies sometimes seem to have no alternative but to succumb to communal or personal pressure in the exercise of their duties or that political considerations make it expedient for those in authority sometimes to depart from a dispassionate treatment of a difficult situation on its educational merits. No one who has any knowledge of India can afford to treat such arguments lightly ; but there is a vital relationship between integrity of administration and the faithful execution of policy, and anyone who has a vision of what an enlightened policy in education, vigorously administered, might do for India can only regard maladministration, from whatever cause it arises, as a major tragedy. In this connexion we would emphasize what has so frequently been said by other observers : that provincial governments have relinquished too much power in the field of education to municipalities and district boards ; and that educational reform is intimately bound up with governments recovering some of that power to themselves or devising ways of insisting upon honest and effective administration by local bodies.

84. We therefore urge that the Indian education service needs a greater austerity of administration and more consistent disciplinary action by authority when groups or individuals, no matter what their status, fail in their duty by allowing their actions to be influenced by improper considerations. If the immediate result of such austerity and such disciplinary action were to dislocate the existing system there would at least be the consolation that new

foundations were being laid on which another, even if a less pretentious, structure could be built.

85. There is one administrative feature of the system which appears to us to be particularly undesirable. The Secretary of the Education Committee of each District Board is one of the government inspectors responsible for the schools in that area. Such an arrangement as this may be necessary as a stage in the development of local self-government, though it is obvious that an inspector of schools cannot work with the maximum of efficiency if he is called upon to serve two masters. But in the United Provinces the position of the Inspector is even more unfortunate. The Government, we understand, is under a statutory obligation to transfer the Inspector from the District if the Education Committee of which he is the Secretary passes a resolution of no confidence in him. This is an intolerable position in which to place an inspector and it is no answer to say that transfers on this account seldom if ever take place. It is not definitive action on the part of the local body which matters but the power to take such action. And of course the position is not redeemed by the fact that the Government, if it were called upon to transfer an inspector on these grounds, could make it clear to him that they themselves had no fault to find with him.

86. When local administration can be relied upon for integrity and efficiency, education committees will presumably have their own officials responsible to them alone. The government inspector will then be in a position to do his work effectively that is a position of dispassionate detachment in which he can act, advise and inspect without fear or favour.

*Continuity of Policy.*

87. So far as continuity of policy is concerned the present administrative arrangements are, in our view, open to grave objection. The Director of Public Instruction appears to combine the functions of a chief inspector and of a permanent deputy head of a department, in which latter capacity he may or may not be Under Secretary to the Government for Education. He belongs to the educational service and, as a rule, reaches the position of D. P. I. only after some experience as a teacher and, possibly, as an inspector. He may have direct access to the Minister of Education and he may in practice be the chief executive officer of the department of education, but he is not its administrative head. The administrative head of the department is the Secretary to the Government for Education, and this post is normally filled by an officer of the I. C. S. He is permanent in the sense that he is a permanent officer of the Government, but he is temporary in that his appointment as Secretary for Education is normally for a short period of years, after which he may, indeed, serve for an extended period but is more likely to be appointed to some other post in the Secretariat, in the Executive branch, or elsewhere. Moreover he may be Secretary to the Government not only for education but for some other subject as well, and thus have responsibilities to more than one Minister ; and he probably reaches his post without previous experience of the administration of education except insofar as he has been brought into contact with it as a District Officer.

88. Education is an extensive and a technical subject ; and its administration inevitably involves delicate and complicated issues. We do not believe

that the formulation and execution of long range policy in education, as distinguished from mere temporary expedients and experiments, can be effective unless one condition, at least, is satisfied. The ultimate direction of education, subject of course to the Minister, must be in the hands of someone whose knowledge and experience of educational administration and whose premanence in the education service give him the qualifications and the right to deal authoritatively with the administrative aspects of educational problems and, with the advice of the D. P. I., with their more pedagogic aspects. Such permanence and such qualifications are necessary not only for the day to day administration of the education department ; they are also essential if the Secretary is properly to discharge his duties to the Minister for Education.

89. We are not suggesting that the Director of Public Instruction, with his present duties, should also be Secretary to the Government for Education. On the contrary we think the D. P. I.'s are already too much immersed in administration for the effective discharge of all their duties, including an authoritative direction of the Inspectorate, based on a personal knowledge of individual Inspectors of all grades and a first-hand knowledge of the content of education provided in the schools. The Director of Public Instruction ought to have secured to him the time and the opportunity for studying educational problems in general and for informing himself about local issues so that he can direct his staff with authority and advise the Secretary and the Minister with conviction. Incidentally we may remark that since there is a significant difference between the connotation of the word " instruction " and that of the word " education " it would be more in accordance with the responsibilities of his office if the Director of Public Instruction were styled the Director of Education.

*The Inspectorate.*

90. The chief duty of an Inspector is to inspect schools. He must do this sympathetically and tactfully and give advice based on his own knowledge and experience which will help the teachers to make their schools enlightened and humane institutions. He should feel free, and of course be qualified, to praise or to criticize ; but his criticisms should be calculated to encourage and not to intimidate. As schools are intended for the education of children his main concern must be to investigate the way in which the children are occupied during their school day. He must find out what they are doing, what they are learning and, so far as he can, what habits they are acquiring. In the course of his duties he will of course examine registers and records to make sure that they are faithfully kept, and he will inspect the premises in order to discover whether they are suitable, not overcrowded and are kept clean, wholesome and in good repair.

91. One thing the Inspector must try to discover about a school is whether it is a happy institution and is related to the needs of the community which it is intended to serve. Are the children enjoying their school life ? Are the staff active and contented ? Is the school a real society or is it only a box of classroom ? To answer these questions he must probe into the work of the school to find out whether there is a reasonable balance of intellectual, manual and physical activities, whether the children are really at work on tasks which are within their competence and in a way which brings them

satisfaction, and whether they are entrusted with such responsibilities for the social life of the school as they are fit to bear. But a school consists of teachers as well as children. The inspector ought, therefore, to be concerned with whether there is mutual confidence between the Headmaster and his staff and whether those who merit it are afforded freedom to plan their own schemes of work, or at any rate to make some departure from centrally devised schemes. But in all his dealings with the school an Inspector must aim at securing the confidence of the Headmaster. He must give the Headmaster reason to feel that an Inspector is not simply a " professional critic ", but a man with whom he can talk freely and frankly about his problems, and from whom he will hear the truth, told sympathetically, but without disguise. If the inspector does not confine himself to the school but makes himself familiar with the area which it serves he may discover whether the school is recognised as meeting local needs and whether it commands the interest and allegiance of parents and the community generally.

92. The duties of an inspector are onerous, and unless he can pursue them without undue distractions the schools and the children in them suffer. There are two suggestions which we would make about the work of inspectors in India. They are frequently called upon by authorities other than the education department to undertake the control or assist in the direction of work which is not strictly within their sphere. This is, no doubt, a tribute to them ; and many of the activities they are asked to help or promote are good in themselves and may sometimes have a relation, direct or indirect, to the work of the schools. It is reasonable that inspectors should play a part in linking up the various social services and should give their blessing and their aid to local efforts not necessarily educational. But the moment an Inspector labours under the feeling that he has more than one master or that the inroads made on his time by having to undertake outside activities is hampering the discharge of his duties as an inspector of schools he loses his significance to the schools and the teachers and ceases to be the asset to the education service which an inspector should be. We would therefore urge the departments of education to ensure that their inspectors act under their direction and are not too often placed at the disposal of other authorities.

93. Our other suggestion is concerned with the travelling allowances of inspectors. We understand that these are subject to an annual limit for each inspector and that in consequence inspectors are sometimes hampered in their work by the necessity of not exceeding it. There are no doubt financial advantages in this system and of course it prevents any extensive malpractice by an inspector who is tempted to misuse public funds. But we feel bound to say that unless the allowance is so large as never to be exceeded, in which case it has no purpose, the imposition of a limit to the travelling expenses of a conscientious inspector, who is anxious to do the best he can for his schools, is very undesirable and bound to lead to exasperation and a sense of frustration. We suggest that a more elastic system of travelling allowances for inspectors, with necessary safeguards, could and should be devised.

*Visits abroad.*

94. We consider it extremely important that the more responsible inspectors should have opportunities of studying educational practice and methods

of inspection in other countries. It is desirable also that carefully selected teachers should pay visits abroad. But if the public funds available to meet the cost of such visits are strictly limited we believe that they could be most usefully expended in securing a wider experience for the inspectorate.

*Conclusion.*

95. There are many aspects of general education on which we have not touched or to which we have made but a passing reference. In particular we have not examined the possibilities of the movement for adult education, nor have we examined the part which the cinema and broadcasting might play in the schools. These are important matters but they are subsidiary to the three main issues : the better training of teachers, a wider conception of the content of education and administrative reform.

96. There are more than 250 million people in British India ; and the majority of them are illiterate. Some people are therefore tempted to talk in terms of mass education. The temptation should be resisted. Magnitude of population is wholly irrelevant to the purposes and to the methods of education ; and, moreover, mass movements tend to deny individuality and to strive after a uniformity which is incompatible with the dignity and the diversity of the human spirit. Education, on the other hand, is concerned with the health, happiness and development of this boy and this girl, this man and this woman, regarded as units in a society which is none other than themselves. The task of the school is to train each individual, according to his capacity, to acquire the knowledge and the skill which will give him satisfaction as an individual and also equip him to take his full share in the work of the community ; and, through its corporate activities and its social ideals, to nurture its pupils in the positive virtues and disciplines that are necessary for the spiritual integrity of a society and for its friendly relations with other societies.

97. Education, whether it be general or vocational, is thus concerned with behaviour. Young people who have had the advantage of membership of a school community up to the threshold of manhood should develop a responsive yet critical attitude to knowledge and ideas, should be equipped to occupy themselves profitably without the constant ministrations of other people, and should be inspired by ideals of courtesy and generosity in their human relationships. Schools will inevitably fail to achieve these desirable ends if they concentrate exclusively on preparing their pupils for a life to be entered upon at some future date. An institution which purports to educate young people must offer them life here and now in a living soceity—a society which depends for its vigour and happiness partly upon their own initiative and conduct. It is true that the final school of behaviour is the wider world in which each of us has ultimately to make his way in company with his fellows ; but, even so, the best preparation for tomorrow is a well spent today. It is idle to expect the younger generation to make a contribution to the good life of their country unless, as individuals, they are offered satisfying personal and social experiences in the schools.

# CHAPTER VII.

## Summary of Suggestions.

98. The following is a summary of our main suggestions with regard to general education and administration

(*a*) Infant classes should, so far as possible, be entrusted to trained women teachers ; and for this and other reasons the development of educational provision for girls and women is of paramount importance.

(*b*) The education of children in the Primary Schools should be based more upon the natural interests and activities of young children and less upon book learning. Concentration on literacy as a narrow objective is unsound.

(*c*) The curriculum of the rural Middle (or Lower Secondary) Schools should be closely related to the children's environment ; and if English is taught to any children of "middle school" age is should not be allowed to result in an excessive amount of time being devoted to linguistic studies.

(*d*) The vernacular languages should, so far as possible, be the medium of instruction throughout the High (or Higher Secondary) Schools, but English should be a compulsory language for all pupils in these schools.

(*e*) The teaching of English should be made more domestic and less attention should be devoted by the average boy to the study of English "prose and poetry"—arrangements being made to meet the needs of those boys specially qualified to pursue more advanced English studies.

(*f*) Manual work, that is creative manual activities of diverse kinds, should be part of the curriculum of every school.

(*g*) More systematic attention should be piad to the teaching of Art ; and steps should be taken to secure for the High ( or Higher Secondary) Schools a supply of qualified teachers of Art.

(*h*) Physical education should not be limited to formal physical training and organized games. Playgrounds should be more consistently used for purely recreative purposes, especially in the case of young children.

(*i*) The training of teachers should be regarded as consisting of two stages pre-employment preparation in a Normal School or Training College, followed by systematic short courses of training for teachers who have had some experience of their profession. In due course a government "refresher" Training College should be established in each province.

(*j*) The pre-employment course of training for teachers of Primary and Middle (or Lower Secondary) Schools should be a three year

course following, without any gap, the completion of the Middle (or Lower Secondary) School course.

(*k*) There should be greater austerity of administration in the education service, more consistent disciplinary action by authority in cases of deliberate maladministration, and recovery by governments of some of the powers relinquished to local bodies.

(*l*) The formulation and execution of long range policy in education demands a more permanent tenure of office by the administrative head of the Department of Education.

(*m*) Inspectors should not be subjected to the distractions which come from serving more than one master ; and their scale of travelling allowances should not be so limited as to hamper the efficient discharge of their duties.

(*n*) Inspectors and, if funds allow, selected teachers should be offered facilities for studying educational methods abroad.

S. H. WOOD.

*May, 1937.*

# PART II.

## Vocational Education.


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# CHAPTER I.

## The Nature of the Problem.

### *Its difficulty and complexity.*

1. The problem of devising a scheme of vocational education in a country like India, where the industrial system is developing, and where the provision of vocational education has hitherto been small, is difficult and complex. It is difficult, because the existing system of education has been carried on for generations with the main object, in its lower stages, of securing permanent literacy in the mass of the population, and in its higher stages, of continuing the literary type of education with little direct regard to the needs of industry and commerce. In general, this system has been accepted as suitable, and to convince parents in India that their sons may with advantage devote themselves to the accomplishment of educational aims not yet universally recognised as worthy may prove a formidable task.

As regards the complexity of the problem with which we are faced, it is to be taken into account that the intention of any pupil following a vocational course of instruction is perfectly definite he proposes to equip himself for a career in a particular industry, perhaps in a particular occupation within that industry, and will be not merely disappointed, but actually discontented, if he finds no suitable post open to him on the completion of his course. A complete solution of the problem cannot be arrived at, therefore, without a consideration of the main activities of industry and commerce, and a classification of these into homogeneous groups, for each of which a scheme of vocational education has been planned.

### *A Dilemma.*

2. Industry in India is usually carried on in small undertakings, the volume of large-scale industry being very small considering the immensity of the population. The number of great industrial undertakings is, in fact, not yet sufficient to make full use of the natural resources of the country for the good of the nation as a whole. Although we are not directly concerned with economic questions in this inquiry, it is relevant for us to point out a serious difficulty which confronts the various provinces in planning their industrial development.

No country can initiate and carry on industries on a large scale, unless it has an adequate supply of men specially trained for the direction and management of large industrial concerns, as well as of others specially qualified for the minor, but very important, supervisory posts in them. On the other hand, it cannot be expected that capable and ambitious men will devote themselves to acquiring this special knowledge and skill, unless they see a reasonable prospect of exercising it and gaining a decent livelihood thereby. While many men will face an adventure, comparatively few will join a forlorn hope, on whose success or failure their whole fortunes and those of their wives and children are directly dependent.

*The need for the cautious expansion of vocational education.*

3. It is for this reason that we are of opinion that the expansion of vocational education in India should be begun with caution and with full regard to the development of organised industry. It would be a great misfortune if a large body of men received a prolonged technical training, and on its completion found that they had no opportunities of using the knowledge they had acquired.

*The importance of flexibility.*

4. If, however, vocational education aims at producing a corps of workers whose minds are flexible, and whose knowledge is capable of wide application, the risks are far less than if it attempts to train a number of persons with narrow outlook and a limited range of skill. Accordingly, vocational education should not be extremely specialised in character, except in its advanced stages, but should aim at imparting a sound knowledge of fundamental principles which are applicable to different tasks, and as high a degree as possible of skill in thus applying it.

If vocational education is broadly based, and if it is successful in developing in the students certain personal qualities, which are as much moral as intellectual, that is, uprightness, diligence, accuracy, self-reliance, resourcefulness and the habit of co-operating with others, we have little fear of the failure of industry and commerce to absorb, in one way or another, a somewhat larger number of trained men than an exact calculation of their existing needs would appear to justify.

*The need for a Survey.*

5. The creation of a suitable system of vocational education, which produces annually a sufficient number of qualified recruits for each branch of industry and commerce and does not leave a number of potential recruits unemployed, demands that every province shall make an industrial survey, in order to determine the types of instruction to be provided, the stage to which the studies in each type shall be carried, and especially the number of recruits which can be absorbed. In an old industrial country this is not vitally necessary, since parents can usually estimate with some approach to accuracy the prospects of employment of a suitable kind for their children : but even in such a country, regular surveys of the field of potential employment would have value. In India, whose industrial and commercial organisations are not yet highly developed, surveys of this kind would be even more useful they are indeed essential, if there is not to be either waste of effort and consequent disappointment, or an inadequate supply of men trained vocationally. Our task of advising on vocational education has been hampered by the lack of these surveys, for our investigation is just as much industrial and commercial as it is educational. All that we have been able to do is to make as full enquiries as to the existing facilities for education, and the existing industrial and commercial features of the provinces visited, as the time at our disposal has permitted and on the basis of these inquiries to prepare an educational frame-work into which, we believe, vocational schools and courses of instruction can be fitted without difficulty.

## CHAPTER II.

### Vocational Education.

*The General purpose of education.*

6. The assumption is often made that education for work in industry and commerce is necessarily on a lower plane than is literary education, since it is concerned with material things, while literary education, being concerned with things of the mind, aims mainly at giving students " an acquaintance with the best that has been known and said in the world and thus with the history of the human spirit " Such an assumption is, however, based on an altogether inadequate view of the function of education, whose full purpose is far wider. It aims at nothing less than the cultivation of the whole powers of the mind, body and spirit, so that when the period of formal education is ended, the pupil possesses both the desire and the ability to devote these powers vigorously and effectively to doing his duty in the complex society in which he lives. It is impossible for him to do this unless he has been brought up to comprehend his environment. His early studies of history, geography and literature ought to have given him some knowledge of the way of life, the doings and the thoughts of his forbears and his neighbours, both near and remote ; he should have gained some facility in expressing his thoughts with accuracy, both in speech and in writing ; and he should have been practised in the estimation of those quantitative relations which are included in the elementary study of mathematics. As soon as he leaves school, he will find himself compelled to use his powers for the satisfaction of his primary needs of food, clothing and shelter, as well as of other needs. He may do this directly by working on the land, by spinning and weaving, or by building ; or, as is usual in a highly organised society, he may satisfy these needs by carrying out other duties and exchanging the goods he produces, or the services he renders, for the results of the labour of other men. Whether his services are direct or indirect, and whether they are primary or secondary, the work of every diligent man, whatever form it may take, is valuable, and even essential, to the welfare of the society to which he belongs. There is nothing ignoble in this work and the task of preparing pupils to do it energetically and with goodwill cannot be regarded as intrinsically less worthy than the study of great literature. Vocational education is emphatically not on a lower plane than other forms of education it is complementary to them.

7. During our investigation, we have discerned, amongst some of the persons we have met, a tendency to assume that the proper aim of every good student is to proceed to the university and, after completing his studies there, to enter upon a professional career outside industry and commerce and that only students of inferior ability ought to aim at a career in business, either when they have finished their general education, or after they have received some measure of vocational training in a technical school.

Such an assumption is, in our view, unsound, since it is based on a belief, whether conscious or unconscious, that a country can maintain and develop its trade and industry through the efforts of second-rate men. We are very far from suggesting that every man of ability, or even a majority of such men, should enter upon a career in business. We do suggest, however, that the

conditions in India, as in every country engaged in the difficult task of developing its industry and trade, demand that business shall have at its service a fair share of the best brains available. We are aware that a number of university graduates are preparing themselves by following post-graduate courses for advanced work in industry, and we are convinced from what we have seen of the courses that these men will give a good account of themselves. At the same time, we believe that other young men of equal ability who aim at occupying posts of responsibility within the workshops themselves would do well to enter industry at the end of the High School stage, in order that they may become thoroughly accustomed, while still at an impressionable age, to the atmosphere and the conditions of the commercial production and distribution of goods. We have stated our opinion that this is necessary for the welfare of the community and we would add that we are convinced that of two men of equal ability, the one who has elected to finish his general education earlier and has subsequently done his utmost to equip himself thoroughly for work in industry or commerce is, at the age of 21 or 22, as well educated as the other who has devoted himself entirely to study in a university atmosphere.

*The Unity of General and Vocational Education.*

8. General and vocational education ought not to be regarded as essentially different branches of education, but rather at the earlier and later phases of a continuous process, fostered by the community, with the object of helping the immature child to develop naturally into a good citizen. If we are to define what we understand by a good citizen, we would say that he is a man who is suitably equipped for the effective performance of his duty of advancing the welfare of the society to which he belongs ; that he performs this duty with goodwill, zeal and a respect for the feelings of others ; and that in so doing, he brings pleasure to himself, benefit to his family and satisfaction to those about him.

9. While the aims of general and vocational education are thus the same in essence, the curricula followed in the two types of school will, at first sight, appear to show considerable differences. In a wisely planned scheme of education, these differences are, however, more apparent than real. Each subject in the vocational school will have its origin in the non-vocational school ; it will in fact be nothing more than an extension of it. Elementary notions of number and the beginnings of arithmetic will gradually merge into mathematics ; the observation and recording of the more obvious phenomena of nature, and simple explanations of these, will develop into science ; crude hand work with few or no tools will become skilled manual work with more complicated tools or with machines ; the powers of expression by the tongue, the pen and the pencil will be extended ; and new and more conventional methods of representing on paper the appearance and dimensions of solid objects will be introduced.

10. It might be supposed, from our constant insistence on the essential unity of the educational process, whatever the age of the pupils or their educational aims, that we should recommend that general and vocational education might therefore be given in the same school. Our experience and knowledge of various other countries, in which technical education has reached a high stage

of development, have shown us that it is unwise to have in the same school pupils who have not yet made up their minds—or had the decision taken for them—which career they will follow, and, at the same time, other pupils for whom the decision to enter upon a particular career in life has already been made. The former are still economically dependent. So are the latter, but they are now definitely on the way to economic independence ; and the two groups of pupils, working with diverse aims, do not readily merge into each other and form that single coherent society which every good school constitutes.

11. The question naturally arises as to whether a school preparing pupils for industrial callings can be carried on in the same premises as one whose pupils intend to occupy posts in commerce. There is no doubt that it can, though there are two conditions for the success of the arrangement. The first is that the principal of the school shall not favour one department at the expense of another the second is that the rooms devoted to the practical work of one department shall always be at its own disposal and not liable to be trespassed upon by another department.

*Vocational education not a matter for the School alone.*

12. Just as we emphasise the importance of regarding vocational education as being an extension of general education, so we stress the necessity of looking upon it as a specific preparation for work in industry, commerce and the professions. It is accordingly not a matter for the school alone, since teachers and school authorities have neither the knowledge nor the experience needed to determine with precision the aims and the volume of instruction to be provided for any particular branch of industry or trade. It is essentially part of the system of recruitment for employment, if we define recruitment very broadly as including :—

(*a*) The instruction, more or less specialised, which is given to a pupil in school after he, or his parents, have decided what career he shall follow.

(*b*) The ' placing ' of the pupil in employment.

(*c*) The gaining of practical experience accompanied, in some instances by further instruction in school.

It is this process of recruitment, consisting, as it does, of a related series of educational experiences, for every boy or girl aiming to be a skilled worker which Lord Eustace Percy has described as presenting " the most serious problem that confronts this country, in common with the whole industrial world, at the present moment " It is true that he was speaking more particularly of Great Britain, but his statement is just as applicable to India.

13. Every great industrial country of Europe is now exhibiting a zeal for the development of technical education which has been described by a German writer as being " almost feverish ", and in every one of them steps have been taken to enlist the interest and co-operation of industry and commerce in the task of ensuring that the instruction shall be both appropriate and sufficient. India cannot afford not to follow their example.

In the provinces we have visited, this close and systematic co-operation has not yet been established, although it is a factor which is absolutely essential for the successful and economical working of any scheme of vocational

education. Further reference to this matter is made in Chapter IV of this report, but, at the outset, we wish to stress the necessity for the establishment of a real partnership between education and business in the work of creating a service which shall be of permanent value to the nation.

*The Expansion of Vocational Education.*

14. Judging from what we have heard from many persons in India, there is considerable enthusiasm in favour of the swift evolution of a widespread system of vocational education. This is quite natural, since there is abundant evidence that while India is rightly demanding more and not less education, the products of an educational system which is predominantly literary are in many instances finding it difficult to put to profitable use the learning they have acquired. In addition to this negative reason for providing other paths to learning, there is also the positive reason that there is everywhere a keen desire to see India more prosperous, and a very general belief that a more adequate supply of vocational education would lead to the further industrialisation of the country and hence to increased prosperity. While we are convinced that the development of organised industries, carried on on the large scale, would do much to secure greater use being made of the raw materials existing or being produced in India, we do not feel at all certain that the slow rate at which such industries can normally be built up is generally realised. The existence of skilled workers, though essential, is not in itself enough to create organised industries. Capital, means of transport and reasonably assured markets are also needed for their creation and growth. Accordingly, while we very firmly believe that it is right to begin the systematic expansion of the facilities for training the workers of various grades on whom the effective conduct of organised industry depends, we hope that this expansion will not be so swift as to overtake that of organised industry itself.

15. Although we thus urge a certain degree of caution in the plans for educating men to be employed in organised industry, we do not think it necessary to utter such a warning in connection with schemes for improving the qualifications and skill of either farmers or small-scale workers, since it is on the intelligence and skill of these men that the prosperity of India is now, and, for many years to come, will be greatly dependent.

## CHAPTER III.

### Some Characteristics of Industry and Commerce in India.

*Agriculture.*

16. We begin our remarks on some of the characteristics of industry and commerce by reference to agriculture, since this is the most important of all industries and gives employment to over two-thirds of the total working population of India. In general, the holdings are small and the cultivators live in villages, isolated from one another by the lack of means of communication and transport. The result is that it was for centuries customary for the farmer to content himself with the production of sufficient for the needs of himself

and of those in his immediate neighbourhood. With the growth of communications and the establishment of co-operative societies, he may gradually find wider markets for the produce of his land, as well as for the articles he may learn to make during the less busy seasons of the year from the raw materials available to him. But the growth of markets and the raising of the standard of life in villages are dependent on the cultivator being able to produce more than is needed by himself and his family. It is therefore of increasing importance that the land should be utilised to the best advantage, and this can only be brought about by improving the methods of farming, based on greater knowledge, and by convincing the cultivator that he will profit by the adoption of new methods.

The problem of improving the lot of the villager by better education is formidable. The population consists mainly of small holders; their villages are generally isolated both from one another and from towns; they are mostly illiterate; and they have a reluctance to abandon old customs and adopt new methods.

*Small-scale and Cottage Industries.*

17. (*a*) *In rural areas.*

The conditions under which small-scale and cottage industries are carried on in rural areas have been discussed fully in the Report of the Royal Commission on Agriculture (1928), who began their review of "Rural Industries and Labour" by pointing out that "the village cultivator, within limits, is an expert in his own subject, just as a blacksmith, or a carpenter or any other mechanic is in his" They went on to say that it is only in exceptional cases that the agriculturist can be anything more than an unskilled labourer in any industry other than his own; and, further, that "the agriculturist who seeks to change his occupation and become an industrialist must be prepared to undergo the training necessary to make an efficient one"

With these facts in mind, the Royal Commission proceeded to consider how village cultivators might usefully occupy their spare time, and after examining various suggestions, reached the conclusion that "the chief solution of the problems of the cultivator is intensification or diversification of his agriculture" and that "the possibilities of improving the conditions of the rural population by the establishment of rural industries are extremely limited" After visiting a number of Indian villages, we are in entire agreement with this expression of opinion.

They mentioned, however, certain spare-time employments which might, in some areas, be available for rural workers; amongst these were cotton ginning, rice mills and sugar refineries. They thought also that an increase in the number of implement makers throughout the country seemed, on the whole, to offer considerable promise.

From our point of view, the most important suggestion was that the more progressive village artisans should be trained "to effect repairs, to stock and fit spare parts and to handle successfully the improved types of machinery which are bound sooner or later to be introduced" We were glad to note during our inquiry that, in several places which we visited, this kind of training is being given; and we were interested to see also the very useful work

being done by the school of tanning in the Punjab in teaching better methods, and the excellent influence which it is exercising in villages.

The suggestion that village artisans shall be trained to handle machinery has even more force now than it had when it was made, since electrical power is always being distributed more widely through the work of the hydro-electric engineers. It seems probable that this factor will ultimately affect profoundly the spread of small-scale industries in the rural areas of both the Provinces.

18. (*b*) *Other small-scale industries.*

The conditions of the small-scale industries and occupations generally in India were discussed in the Report of the Indian Industrial Commission (1918). They divided them into two main types

(*i*) Those which compete directly with organised production, such as weaving and certain branches of metal work, and

(*ii*) Trades like carpentry and blacksmith's work, which are usually carried on as handicrafts even in those workshops engaged in large-scale production.

As regards the former group, they said that what is needed is that the workman shall be equipped with better appliances, and that he shall have the ability to use these effectively. As regards the latter group, they pointed out that the quality of the work and its speed depend entirely on the personal skill of the workman. While the Commission expressed the view that the training of the handicraftsman working on his own account ought to be different from and more elastic than that of the craftsman who becomes a unit in organised industry, they indicated the need for training both types.

19. Manufacture on a small scale is very prevalent in India. It is liable at all times to be displaced, either wholly or in part, by manufacture on the large scale in factories. A great part of Europe and of the United States of America have seen such a displacement, and it is not unlikely that India also will witness it. Even in the intensely industrialised regions of Europe and America, however, small-scale industry is, in some branches, able to face factory competition successfully. It continues to hold its own very frequently in the manufacture of goods not needed in large quantities for example, practically every small town in England provides employment for a jobbing printer. It continues to flourish in those branches of manufacture also where the goods produced have to possess an individuality and character of their own : thus, boots, men's and women's clothing and jewellery are still made in Europe to suit the wishes and tastes of individual consumers, though the bulk of the boots and shoes, as well as of the clothing, sold in many parts of Europe and America are now produced in great factories. There is no reason to suppose that the kind of small-scale production we describe will disappear while the present economic conditions exist.

20. When we look at the list of goods produced on the small-scale in India, there is clearly a possibility—if not indeed a probability—that the task of manufacturing them will be transferred to an increasing extent to organised industry carried on in factories and employing machines to do the work now

done by hand. If the dislocation of labour due to this is not to lead to further unemployment, or if, at least, the speed at which the centralisation of industry into factories is to be adjusted in order to give the small-scale workers the opportunity of adapting the mselves to the changing conditions, definite and speedy action is necessary. The small-scale industrialist must be so educated and trained that his goods possess individuality and character : and this involves far greater attention being paid to his education, and especially to his training in art.

*Organised Large-scale Industry.*

21. The Royal Commission on Labour in India, who reported in 1931, stated that to a large extent factories, mines and even railways are the creation of the last generation. In support of this statement, they pointed out that in 1892 the total number of persons engaged in these industries was about half a million, while in 1929 it was about two and a half millions. In spite of the check to progress which has been experienced, they expressed the opinion that, given settled conditions, factory industry has still a long period of expansion before it. In this connection, it is significant that while there was a slight decrease in the total number of workers engaged in industries from 11 per cent. in 1921 to 10 per cent. in 1931, the number of persons engaged in " the manufacture of chemical products " , in the " production and transmission of physical force, that is, in heat, light, electricity, motive power, etc." and in " making, assembling or repairing motor vehicles or cycles " shewed considerable increases. These figures are consistent with a growth in the total volume of organised industry.

The Indian Industrial Commission which reported in 1918, looking at organised industries from the point of view of the actual training needed for their personnel, divided them into two classes :—

(*a*) The " manipulative industries " *e.g.*, certain branches of mechanical engineering, the pottery and glass industries, textiles, tanning and mining, in which " large practical experience is necessary for the supervisor to estimate the working conditions and determine whether the quality and output of the work is satisfactory."

(*b*) The " non-manipulative or operative industries ", *e.g.*, the manufacture of sugar and chemicals and oil and rice milling, " where, on account of the automatic or semi-automatic character of the plant, or of the simplicity of the process, the necessary knowledge can be more quickly acquired "

The Industrial Commission pointed out that the first class of industries usually requires a training in industrial concerns, while in the second class, the only training that can be given is mainly technological, consisting, for example, of a course in industrial chemistry of a special type, together with some training in the handling of machinery and in the making of drawings. They added that although the student who intends to enter one of the non-manipulative industries will require practical experience this need not be obtained at a very early stage in his career.

*The Size of the Industrial Unit.*

22. It is characteristic of organised industry that it usually employs large groups of workers in each of its units of production. In India, these groups are, in some instances, *e.g.*, that of textiles, far larger than in Western countries, as is shown by the following table extracted from the report of the Royal Commission on Labour issued in 1931 (page 6).

| Industries. | No. of factories. | Average daily number employed. |
|---|---|---|
| Cotton Spinning and Weaving | 295 | 338,000 |
| Jute Spinning and Weaving | 95 | 347,000 |
| Other textiles | 68 | 11,000 |
| Total Textiles | 458 | 696,000 |
| Engineering and Metal Works | 871 | 315,000 |
| Others (Non-textiles) | 1,122 | 155,000 |
| Grand total | 2,451 | 1,166,000 |

From this table it appears that the average daily number of persons employed in a single factory of each group was in 1931 :—

| | |
|---|---|
| Cotton spinning and weaving | 1,145 |
| Jute spinning and weaving | 3,652 |
| Other textiles | 152 |
| Engineering and Metal Trades | 360 |
| Others (non-textiles) | 138 |
| Average for all groups | 476 |

*The grades of workers.*

23. In general there are three grades of workers in each industrial undertaking of any size. These are :—

(*a*) The directing and managing grade.

(*b*) The supervisory grade, that is, foreman, chargehands, etc.

(*c*) The operative grade.

*The directing and managing grade.*

The number of persons in the directing and managing grade, in any industrial country, is small in comparison with the total number of persons employed.

In India, where, as we understand, the operative labour is usually less efficient than it is in Western Europe, the proportion of the directing grade is very small.

There is accordingly no great demand, in the present circumstances of organised industries in India, for an immediate and considerable increase in the facilities for the vocational education of the members of this group, important as they are. Many of them have been educated outside India, or have, at any rate, gained some of their experience abroad. This is inevitable, since the industries conducted on the large-scale have been introduced from other countries and are engaged in the conversion of Indian raw materials into saleable products by employing the same machinery and methods as are used overseas.

It is important, however, that India should, through her technical schools and universities, devote the most serious attention to the education and training of the members of the directing and managing class.

24. We have seen with great satisfaction the work in applied science and technology now being done under able direction by post-graduate students and others at the various universities in the Punjab, the United Provinces and Bombay, as well as by advanced students in such institutions as the Maclagan Engineering College at Lahore, the Harcourt-Butler Technological Institute at Cawnpore, the Lucknow Technical Institute, the Dyeing and Textile Schools at Benares and the Central Woodworking Institute at Bareilly. Much of the work done in these institutions reaches a high standard, and we believe that many of the young men who are now being trained in them will ultimately play an important part, as research workers, managers or directors of industrial undertakings, in the development of large-scale industries in India. So far as we are able to judge, there is no need to add to the number of institutions giving instruction in this grade in either the Punjab or the United Provinces, since practically all of them appear to be capable of expansion when the need arises.

*The supervisory grade.*

25. The supervising class is the one on whose education and training attention should be concentrated at this stage in the evolution of organised industry in India. It is this grade of workers, intermediate between the management and the operatives, which ought to have sufficient knowledge and intelligence to understand the instructions of the former and sufficient powers of expression to communicate and interpret them to the latter.

If engaged in the "manipulative" group of industries they should, in general, have such an acquaintance with the theoretical principles underlying workshop operations as to enable them to understand what the various machines are doing, and how the elements constituting the machines should be adjusted to the different kinds of raw material used or of product desired At the same time, they should have sufficient practical skill to earn the respect and confidence of the operatives whose work they direct, control and supervise.

If, on the other hand, they are employed in the "non-manipulative" group of industries, they should have some knowledge of the theoretical principles underlying workshop practice, but manipulative skill is obviously less necessary.

The importance of the sound and adequate training of the supervisory group of workers cannot be over-estimated ; the foreman holds, in fact, the key to efficiency in production.

*The operative grade.*

26. The full-time vocational schools can, as a rule, do very little for the operative grade of workers, since these receive in the works itself what training is necessary for the proper performance of their duties. There are, however, exceptions to this general rule ; the men engaged in the maintenance of the mechanical plant of a works, *i.e.*, those entrusted with the care of engines, the repair of electrical and other equipment, the upkeep of the fabric of the building and similar duties, would derive benefit from a systematic training in the crafts they practise.

*The sub-division of all these grades.*

27. Although these three great divisions normally exist in any organised industry, and indeed in any individual undertaking of considerable size, they are frequently sub-divided into smaller groups. Thus in the management group, there are often not only general managers responsible for the direction and control of the whole of a great undertaking, but also departmental managers directing and supervising single departments in the supervisory group, there are men with larger and smaller responsibilities ; and in the operative group there may be skilled, semi-skilled and unskilled workers.

*The vertical mobility of labour.*

28. In spite of the division of the personnel of industry into the groups just described, we attach great importance to the existence of ample facilities for the promotion of individual workers to more responsible duties. No industry can possess the flexibility and the strength on which its successful conduct depends unless its directing and supervising groups are drawing life and energy from every available source. Moreover, it can never receive the same quality of service from its subordinate officers as it requires if every one of them knows that he has no prospect of advancement, whatever the efficiency of his work or the energy he devotes to it ; and when we speak of advancement, we have in mind not merely promotion within a particular grade but also from this to a higher grade. The maximum efficiency in an industrial undertaking can only be secured if there is reasonable and legitimate scope for ambitious men of diligence and ability to rise. There is no doubt that the "vertical mobility of labour" in British industry has been for more than a century one of the most potent factors in the increase of its efficiency. Every one who has even a slight acquaintance with business firms in Great Britain can at once recall instances of men who have entered upon their life's work in humble positions, with few advantages, and have built up successful businesses, or risen to positions of high responsibility in business through their industry, their ability, their good health and—it must be said—their good fortune. In this process in Great Britain education has often played a most important part. In urging, therefore, that a systematic scheme for the vocational training of the supervisory officers of industry and commerce should be formulated and put

into operation in India, we stress the importance of giving to such men every practicable opportunity for rising to higher grades.

29. Although we, following the Indian Industrial Commission, divide organised industry into ' manipulative ' and ' non-manipulative ' branches, we ought to add here that the grading of the personnel which has been described above occurs, broadly speaking, in both groups. We are conscious, however, of certain differences in the actual character of the education and practical experience needed by those engaged in the functions of management, and especially in that of supervision, in the two branches. We refer to this point in later sections of our Report (Sections 78 and 79).

*Commerce.*

30. When we examine the forms of activity which are collectively known as ' commerce ' it is obvious that they are almost as diverse in character as are those of productive industry, and that they include the conduct of operations differing as much in magnitude as, for example, do those of a shoe-maker working on his own account and those of a great textile or engineering firm employing thousands of workers, or of a great merchanting firm.

Whatever its character, and whatever its scale, every commercial operation is, however, related directly or indirectly to the primary function of trading, that is, of buying and selling. There is nothing in commerce which is not ultimately concerned with this. Associated with trading there have grown up in the course of time other functions ancillary to it—banking, accountancy, insurance, the practice of commercial law and secretarial work—each of them carried on by men of professional attainments and standing.

*Main divisions of workers in Commerce.*

31. The great merchants, the industrialists carrying on transactions on a large scale, seeking their raw materials over a wide field and selling their finished goods in the most distant markets, as well as the men engaged on the professional side of commerce, constitute, however, but a comparatively small proportion of the total number of persons earning a livelihood through work in commerce. They are engaged in initiating and carrying to a successful issue business transactions; but, side by side with them, serving them and carrying out their instructions there is a vast army of clerks, who are engaged in the humbler, but necessary, task of recording accurately and faithfully the details of transactions carried out by others.

## CHAPTER IV.

### Co-operation between business and Education.

*In the Planning of Vocational Education.*

32. Reference has been made in an earlier section of this Report (Section 13) to the necessity of vocational education being regarded and treated as the point concern of education and of industry and commerce. Without the close

and regular co-operation of these two interests, the contribution made by Indians educated in their own country towards the expansion of large-scale industry will be far less than is desirable.

The problem of devising means for securing this co-operation is not new. It has confronted every country which has created great industries, and the more nearly it has approached complete solution, the more economically and effectively has vocational education been provided.

33. In Great Britain and elsewhere, the evolution of large-scale industry called into existence federations of employers, trade unions, Chambers of commerce, professional institutions and other associations of men engaged in either industry or commerce. While these were originally formed for purposes other than that of encouraging education, yet a number of them are greatly concerned with raising the standards of attainment in the branch of business in which they are interested and their activities are increasing.

Similarly, there have existed for a generation in Great Britain not only the Board of Education, which is the central Government Department concerned with Education, but strong Local Education Authorities established by statute.

Accordingly, when the need for closer co-operation between business and education became manifest, there were already organisations representative of both, and all that was necessary was to bring these into proper relations with one another.

34. At the present time, the Board of Education is co-operating—usually through the services of its inspectors—with such national bodies, for example, as the Federation of Boot and Shoe Manufacturers, the Institution of Mechanical Engineers and the City and Guilds of London Institute, in the drafting and continuous revision of schemes of instruction in the many subjects included in vocational education as a whole.

Similarly, local Associations of business men, *e.g.*, the Manchester Chamber of Commerce, co-operate with the Local Education Authority in whose area they exercise their own activities.

This co-operation is generally of recent growth, but it is becoming daily more fruitful.

35. In view of the conditions in India, it is doubtful whether the collaboration which exists in England between the interests concerned respectively with education and business can for some time be established on a sufficiently wide scale, for the strong and stable organisations on which reliance is placed in England have not, as yet, been established so widely. We have thought it worth while, however, to describe briefly how co-operation for educational purposes has developed in England, since it is possible that the conditions for successful co-operation may ultimately exist in India.

36. The formation of large national associations of farmers and of small industrialists is difficult even in countries with far better means of communication than India. The need for the co-operation of agriculture and small scale industry with education is, however, just as urgent as in the case of organised industries carried on on the large scale.

37. As regards commerce, there appears to be little immediate prospect of the establishment of powerful provincial or national organisations, representing its various phases, which can play an important part in the development of vocational education.

*An Advisory Council for Vocational Education.*

38. We believe that the solution of the problem of securing the co-operation of industry and commerce with education lies in the establishment by the Department of Education in each Province of an "Advisory Committee for Vocational Education", which would be properly representative both of industry and commerce and of education. In each Province, it would necessarily include the Director of Public Instruction, the Director of Industries, two or three principals of important vocational schools, and four or five business men selected and appointed by the Provincial Government itself, not as representing interests, but on account of their knowledge and experience of particular branches of industry and commerce and their willingness to contribute to the solution of the problems confronting the Department of Education.

This Council, as its name implies, would have advisory powers only. It need not be large, since it would entrust most of its detailed work to appropriate Advisory Sub-Committees, each dealing with one of the main branches of industrial or commercial education, and reporting to it. Necessarily, these Sub-Committees would consist of members nominated by the Council and possessing the same kind of educational or business qualificatious as the members of the Council itself.

*The Chief Advisory Sub-Committees.*

39. There would necessarily be Advisory Sub-Committees dealing respectively with education for—

(*a*) Engineering.

(*b*) The Textile industries.

(*c*) Agriculture.

(*d*) Small-scale and cottage industries.

(*e*) Other industries of major importance.

(*f*) Commerce.

It is of special importance that the Advisory Sub-Committees concerned with the textile and the small-scale industries should include representatives with the knowledge needed to advise on the application to them of art.

*The Functions of Advisory Sub-Committees.*

40. The main functions of the Sub-Committees would be to draft curricula and syllabuses of instruction, to advise as to the equipment needed for carrying these out effectively, to suggest where schools should be set up, to visit the schools regularly and in general to do everything in their power to ensure that the branch of vocational education in which they are specially concerned is really successful.

As regards the curricula and syllabuses, a great wealth of material of this kind exists in Great Britain, as well as in other European countries, and this could be made available for use in India. We do not suggest that either the curricula or the syllabuses used in other countries should necessarily be adopted as they stand but they are the result of many years of experience, and would undoubtedly serve as a useful basis of discussion when instruction specially suitable to Indian conditions and needs is being planned.

41. It is important to emphasise the fact that in any Advisory Sub-Committee of the kind we have described, the representatives of business and of education do not perform exactly the same function when schemes of instruction are being drawn up. Each party brings into the common pool a contribution based on its own special knowledge and experience. Essentially, the procedure is as follows :—

(*a*) Industry and trade define their educational needs as precisely as possible, that is, they prepare a specification stating the attainments and the qualities which they wish their recruits to have. Obviously, in a new scheme, they would be performing a most useful service if they were able to give a quantitative estimate of the annual intake into business of suitably qualified recruits within the area with which they are concerned. This involves, in fact, the kind of industrial survey, with a limited objective only, to which we referred in an earlier section of this Report (Section 5).

(*b*) The representatives of education examine the specification in order to ascertain whether it is one which it is proper and practicable for the schools to satisfy. If they are convinced that it is, they proceed to draft suitable curricula and syllabuses.

(*c*) These are considered by the full Advisory Sub-Committee and, when agreement is reached, submitted for approval to the Advisory Council itself and then put into operation.

Although this is the essential method of procedure, its various stages are not usually so clearly articulated as our description suggests. In many instances within our knowledge, an individual representative of education who has himself had experience of industry or commerce drafts curricula and syllabuses which are submitted to the full Sub-Committee almost at its first meeting and become the subject of discussion.

42. We have stressed the importance of industry and commerce taking an active part in planning schemes of instruction which shall fulfil the reasonable requirements of business and shall not provide many more recruits than business can readily absorb. If industry and commerce would systematically and earnestly perform their part, they would be doing an inestimable service at a time when it has become evident that vocational education must be provided on a larger scale if the prosperity of India is to be enhanced.

*Other Methods of Co-operation between Business and Education.*

43. Although businessmen and their organisations can give most valuable help in the planning of vocational education, there are other methods open to

them of assisting in its development. It is quite clear that its expansion cannot be brought about without incurring additional expenditure, since this involves the adaptation of buildings, the provision of special equipment and of raw materials, the re-adjustment of some parts of the machinery of administration and the training of suitable teachers. Progress towards rendering the system of vocational education in India fully adequate to her needs may, for this reason, be slow, though we hope that it will, as soon as possible, be made sufficient for her more pressing requirements, and completed within a specified period. This process can be accelerated considerably by the material assistance of large employers, which is freely given in some countries, notably England, France and Holland, although it is by no means confined to these. We are encouraged to think that similar assistance, although possibly on a smaller scale, would be forthcoming in India also, if the outstanding need for an increase in the volume and standard of technical education were generally realised, and if the firms concerned were convinced that their contributions would yield valuable results. We have been impressed during our visits to Indian schools giving a general education by the generous support they frequently received from voluntary contributors interested in their work, and we hope that equally generous support would be available for this form of education also.

44. The assistance given by benevolent employers takes various forms. In England, France and Holland, to mention three countries with whose provision of technical education we are well acquainted, a number of firms conduct schools for their apprentices on their own premises, providing accommodation, equipment and the services of competent teachers. While part of the cost is defrayed from public funds, the remainder is found by the firms themselves.

45. In some instances, the premises of technical schools in important centres of industry in England have been built at the cost of employers. Thus, the Technical Schools at Chesterfield and Middlesbrough were erected, in one instance by an individual and in the other by a single family, at a total cost of considerably more than £100,000, while about the same total sum was contributed by a number of local employers towards the cost of extending the important technical school at Huddersfield and Manchester.

46. Industry is assisting technical education in England by gifts to the schools of equipment and materials also. There is no recent information available as to the total annual value of contributions of this kind, but during the three years ending March, 1925, it amounted to more than £40,000 in each year. There is no reason to suppose that it has diminished since that time, and the fact that the number of technical schools benefiting from the donations was as many as 92 indicates that the willingness to encourage this type of education by voluntary gifts was wide-spread.

47. The help given by business to vocational education is most considerable in France, where indeed it is not voluntary but compulsory. Every employer who pays more than 10,000 francs (*i.e.*, about Rs. 1,300) a year in wages is bound by law either to pay a special tax (the " taxed'apprentissage ") of two francs for every thousand francs of the wages he pays, or to shew that he is entitled to be excused from the whole or part of this tax because he is already

contributing in other approved ways to the proper education of the young persons in his employ. One firm, which was exempted altogether from the payment of the tax, satisfied the authorities that it was already spending on the training of its apprentices four times the sum which would otherwise have been due from it. The total yield of the tax in a recent year, after all the proper exemptions had been made, was 160 million francs (worth at that time nearly three crores of rupees), and this was devoted to vocational education and related purposes.

Necessarily, certain administrative machinery exists for ensuring that the tax is not improperly evaded, but so far as we can learn from enquiries made during visits to France, this plan of raising funds for the development of technical education in that country is working smoothly.

47. We realise that in making comments on the finance of technical education, we may be considered to be going outside our province ; but we feel bound to call attention to the fact that it is not by any means a cheap form of education, and at the same time to describe how the burden falling on the general taxpayer is being lightened in several countries of Western Europe by the active support of employers. Many employers who give this support dislike being looked upon as philanthropists, and say frankly that they regard it as constituting a valuable investment, since it helps them to prevent loss of money through the ignorance or lack of training of their employees. If only the same kind of support were available in India from industry and trade, the development of vocational education would be hastened and the consequent growth of profitable industry would be fostered.

## CHAPTER V.

### The organisation of Vocational Education.

48. The structure of the system of vocational education is necessarily complex, since it has to take into account the training needed by the innumerable types and grades of the workers engaged in industry and commerce. This training may be intended for pupils whose employment has not yet begun ; or it may be organised for those who have already entered upon their work in life. In the former case, it will normally be provided in schools involving full-time attendance, while in the latter it will be given in schools requiring only the part-time attendance of their pupils. Again, it may be elementary or advanced ; and its degree of specialisation may be small or great.

These considerations suggest that we should give a brief analysis of the structure of vocational education before proceeding to discuss these forms which appear appropriate to Indian conditions.

#### *Means of Classification.*

49. Some means of classifying the schools must be sought and the most convenient are afforded by a consideration of two cardinal factors :—

(*a*) The standard of admission to each school ;

(*b*) The precise vocational aim of the instruction it provides.

*The Standards of Admission to Vocational Schools.*

50. We have considered carefully the question of the standards of admission to schools with a vocational aim, and in this connection, two matters appear to us to be of fundamental importance. In the first place, nothing is more certain than that a satisfactory vocational education must be based on an adequate general education ; we regard this as axiomatic. In the second place, it is most undesirable to commit a child to a particular career until he is old enough for his inclinations and his aptitudes to have been ascertained.

51. We recommend therefore that the entrance standard to a vocational school shall not, as a rule, be lower than that attained at the end of the Middle School (Class VIII). A pupil who has reached this stage is ready for transfer to the lower type of vocational school, which we suggest shall be known as the "*Junior Vocational School*"

52. The next break in the system of general education will come, under the proposed scheme of reconstruction, at the end of the Higher Secondary School (Class XI). Pupils who have successfully completed their studies up to this point may be transferred to a higher type of vocational school, which is conveniently termed the "*Senior Vocational School*"

53. We regard it as important that there shall be a suitable test of fitness to benefit by the instruction given in both these grades of school, and accordingly we welcome the proposal that a "First Public Examination" shall be instituted for children who completed the ordinary course in the Middle School, and we recommend that the passing of this examination shall be made the normal condition of admission to "Junior Vocational Schools" This applies to both full-time and part-time schools.

54. As regards the "Senior Vocational School", there are already in existence the matriculation examinations of the various universities, and the possession of a matriculation certificate (or its equivalent) should, in general, be required of candidates for admission to this grade of school, although exceptions should be made in the case of young men who are able to produce satisfactory evidence of their fitness to benefit by the teaching given. Even in these instances, however, admission should be conditional on their having passed the First Public examination and subsequently pursued some form of study.

*Schools involving Full-time Attendance.*

55. An analysis of the functions of full-time vocational schools indicates that they fall into three possible types :—

(*a*) Those which impart to their curricula during the last year or two of school life a definite bias towards preparing their pupils for work in industry or commerce. This bias is usually slight, and is not related specifically to any one branch of industry or trade. The educational foundation of the instruction remains broad, since the object is not so much to give techincal skill as to make the transition of the pupil from school to employ-

ment less abrupt. The bias is given by looking at old subjects from a fresh angle, as well as by introducing new subjects into the curriculum. An example of the different treatment of old subjects occurs in the teaching of history and geography. In the former, increased attention is paid to modern history and to great changes which have marked the course of the last half century in the latter, physical geography tends to be replaced by commercial geography. A new subject which is sometimes brought into the curriculum is an elementary study of the principles of accounts or of statistics. The school does not become a technical school, but remains a place of general education.

A few of the secondary schools in England are now developing a commercial bias in their teaching, sometimes before the age of sixteen and occasionally between the ages of sixteen and eighteen for those pupils who have passed the "School Certificate" examination, and are staying at school for a period before entering employment. A bias in the direction of industrial employment is rare in schools of this grade, as it is rightly thought that the ordinary instruction in mathematics, physics and chemistry forms a suitable bases for the later study of technological subjects.

A bias towards the needs of industry or commerce is frequent in the English "Central Elementary Schools", whose pupils normally leave school soon after reaching the age of fifteen.

(*b*) (*i*) The schools which afford a preparation for employment in on occupation to be selected at the end of the school course from a range of those included either in a group of related industries, *e.g.*, the constructive industries of engineering or building, or in a single highly organised industry. These schools are known in England as "Junior" or "Senior" Technical Schools according to their grade.

The Junior Technical Schools do not appear to have any exact analogues outside England, and even there they are not numerous, as they have only about 25,000 pupils in attendance. They enjoy, however, a deservedly high reputation, and their number is likely to increase. It should be emphasised that the Junior Technical School is a pre-apprenticeship school and does not profess to teach a skilled trade; all that it aims at doing is to lay a solid foundation for the future industrial experience and for the more advanced theoretical studies which the more able and ambitious of its pupils may desire to undertake.

As this type and grade of school appears to us suitable for meeting many of the educational requirements of organised industry in India, it is discussed more fully in a later chapter of this Report.

The Senior Technical School, receiving pupils of longer general education, prepares them for entrance to employment in a

grade demanding better initial qualifications than those possessed by pupils leaving Junior Technical Schools.

(*ii*) Parallel with the Senior technical schools just described are the Senior Commercial Schools whose aims, *mutatis mutandis*, are very similar to theirs. They resemble the Technical Schools in that they do not usually prepare their pupils for one specified occupation in commerce, but aim at giving him such a preliminary knowledge of the methods of commerce as will enable him to take up the particular task which either attracts him, or is available for him, when he enters employment.

(*c*) The schools which train their pupils specifically for entrance to a single occupation, *e.g.*, carpentry or bookbinding. These schools exist in large numbers in France and other European countries, but are somewhat rare in England, where they are called " Trade Schools " They differ fundamentally from the Junior Technical Schools, in that they are *schools of apprenticeship*, which provide real trade experience. They are, in fact, comparable with the " Industrial Schools " which have been established in India, although they usually devote more time to the continuance of the general education of their pupils than is usual in India. We ought to add that while we are of opinion that ultimately the entrance standard to this type of school should be just the same as that prescribed for the Junior Technical School, we realise that it may be necessary as a temporary measure to accept pupils with a somewhat lower qualification. This question is discussed in a later section of this Report.

*Schools with a vocational bias.*

56. While all these types of vocational school exist, they are not necessarily suitable for adoption everywhere. The first type mentioned, which has no more than a vocational bias, can only be developed successfully after the system of general education has become stabilised, since it is a variant of a normal type of school. At the present time, it is proposed that the educational system of India shall undergo considerable modification, and until this process is approaching completion, it would, in our opinion, be unwise to confuse matters by attempting to change any part of the unfinished structure. As soon as the new system has been organised, and the public are acquianted with the precise functions of the constituent schools, the possibility of imparting a vocational bias to the teaching given in some of the High Schools should be carefully considered.

57. What has just been said does not apply to the education of those who intend to engage in the practice of agriculture. Schools with a rural bias already exist in India, and we have noted with great interest their organisation and methods, as well as some excellent schemes for training teachers for work in them. We believe that schools of this type should be established even more widely than at present, as we have far greater belief in their value

than we have in that of schools for boys which purport to teach the "subject" of agriculture.

*The Junior Vooational School.*

58. In the proposed new framework in which the educational system of India is to be organised, the Junior Vocational School would be parallel to the Higher Secondary School, that is, it would admit its pupils at the end of the Middle or Lower Secondary School and retain them, as a rule for three years (Classes IX, X, and XI). Just as pupils in Higher Secondary Schools will enter for a leaving examination, so it is hoped that arrangements will be made for pupils in Junior Vocational Schools to enter for an appropriate examination at the end of their course, and that the certificates awarded to them will enjoy the same repute as is now enjoyed by matriculation certificates. The question of the method of awarding certificates to pupils who are educated in vocational schools is dealt with in a later section of this Report (Section 68).

59. As the Junior Vocational Schools would have to prepare pupils for a variety of careers, they would have to assume a number of forms, each differing from the others in accordance with its vocational aim. As a rule, the first two years of the course would be to a great extent common to pupils preparing for somewhat diverse employments, while the third year would be specialised in accordance with the needs of particular forms of employment.

*The Senior Vocational School.*

60. Some recruits to industry and commerce, as well as to certain professional occupations, enter upon their specialised work at comparatively late ages, and it is for these that the Senior Vocational Schools can provide a suitable training. Like the Junior Vocational Schools, they should refrain from attempting to give an apprenticeship course, this task being left to the existing "Industrial Schools" carried on in various Provinces. The functions of the Senior Vocational Schools is to lay down for their pupils that firm foundation on which apprenticeship (or its equivalent—professional "pupilage") can be built, and not to serve as substitutes for workshop or office experience.

61. If a student entering a Senior Vocational School is to follow with profit a scientific or technological course, he must have acquitted himself with credit in the subjects of mathematics, physics and chemistry at the Higher Secondary School, while if he proposes to devote himself to the study of commercial subjects, he ought to produce evidence of his satisfactory study of, at least, geography, history and English. In other words, the student entering a Senior Vocational School must already have made some progress in subjects which have an organic relationship with the subjects of the course which he proposes to follow. Strict adherence to a rule of this kind will prevent waste of time and money by both the students and the uthorities maintaining the school.

62. The question naturally arises whether a pupil who has obtained the "leaving certificate" of a Junior Vocational School should be admitted to a Senior School. We regard the Junior Vocational course as leading directly

either to employment or to further training in an Industrial School, and not as normally forming a basis for more advanced scientific study. We believe therefore that few students who have completed this course ought to continue their pre-apprenticeship education in a full-time school. At the same time, we do not think that there should be any bar to this procedure, so long as good reason is shewn, and we are of opinion that where it is adopted, the leaving certificate of the Junior Vocational School should carry exactly the same weight for this purpose as the matriculation certificate normally required of a candidate.

63. In making these recommendations relating to Senior Vocational Schools, we realised that the total number of students joining those of the industrial type would probably be small, not only when they were first established, but permanently, since the proportion of men holding high posts in industry is small in comparison with the number of men holding lower posts. We are convinced, however, that the necessity for them exists, since no country which is engaged in the attempt to utilise more fully its natural resources and to expand its markets can afford to rely for the most part on a personnel whose formal education (whether general or technical) has ended at the age of sixteen or seventeen. It is true that we contemplate that the universities will make a larger contribution to the staffing of industrial and commercial concerns. We look forward too, to an increase in the proportion of men arising through a process of natural selection to higher posts, and indeed to posts carrying the highest responsibilities. But this is not sufficient. The conditions of India demand that her industries shall have the services of men who, while not having had the advantages of a university education, have received a prolonged general education before entering upon specialised studies in the Senior Vocational Schools.

64. The Senior Vocational School would, like the corresponding Junior School, include several sub-types, each preparatory to a different career. It should, as a rule, provide a two year course (Classes XII and XIII), but for certain forms of study it should be planned to cover three years. It is improbable that many pupils would leave before completing the full course laid down; their parents have already committed themselves to continuing the education of their sons up to the end of the Higher Secondary School and will not usually be inclined to break it off before it is completed.

*Part-time Schools.*

65. In every industrial and trading country, there are large numbers of young men already engaged in business who have the natural ambition either to improve their qualifications for the duties they are performing, or to gain fresh knowledge and skill in order that they may obtain promotion. While their aims may be accomplished in some degree by private study, especially if they have suitable guidance as to their reading, there is no doubt that their ambitions will be more easily and fully satisfied if they have facilities for attending properly equipped schools, where good teaching is available. Since the ordinary work of an employee occupies him all day, the only opportunities he has for attending school are in the evening, unless he is released by his employer for some period during the day time. Accordingly, most

industrial countries have established systems of part-time education for persons already employed. In Great Britain, by far the great volume of technical and commercial educations is given in evening Technical and Commercial Schools, although the release of deserving young men for day-time instruction is increasing. In Czechoslovakia, all employers are bound by law to afford facilities for their younger employees to attend school during working hours; and other instances could be quoted of the prevalence of recruits to industry being set free during the day time for attendance at school. There is no doubt that this form of instruction for employed persons is far more effective than that provided in evening classes, when the pupil is tired out and his mind is no longer fresh.

We have learned with great satisfaction that some, at any rate, of the railway employees in India are allowed to attend classes during working hours, and we hope that this practice will become more frequent in India.

66. We reserve the detailed discussion of the aims, organisation and functions of different types of vocational school for a later chapter of this Report.

*Examination in Vocational Schools.*

67. *Entrance Examinations.*—Pupils admitted to vocational schools will already have passed a qualifying examination at the end of their general education, and this should be regarded as entitling them to admission to the appropriate grade of school unless it happens that there are more candidates for admission than vacancies. In this case, it will be necessary to hold a special entrance examination in the subjects they have already studied. It is suggested that this should include an oral test conducted by the principal of the vocational school which might be carried out in the presence of any members of the school committee who cared to attend.

It is hoped that at the start of the vocational schools, there will be a few more candidates for admission than can be accepted. This would have the advantage of giving some freedom of choice amongst the candidates. It would have the further advantage that the parents of the successful applicants would regard the admission of their sons as something of an achievement, and this would undoubtedly add to the prestige of the school.

68. *Leaving Examinations*:—It is important that pupils leaving vocational schools shall be awarded certificates indicating (*i*) that they are capable and diligent students, and (*ii*) that they have reached a minimum standard of knowledge and skill.

We are strongly of opinion that it is essential to record on the certificates not merely the performance of the students in the leaving examination, but also the quality of their work during the whole of their course. Accordingly,

each student should have a book (kept by the principal) in which are recorded regularly :—

(a) his percentage of attendance

(b) his marks for each subject of class-room instruction (calculated weekly),

(c) his marks for each subject of laboratory instruction (calculated weekly),

(d) his marks for homework (calculated weekly)

(e) any other significant marks.

69. Briefly, the certificate should indicate concisely not only the performance of the pupils on the days of the final examination, but also the way in which he has conducted himself during his whole career as a pupil in the school. No certificate should be issued to any pupil whose record of work done is not completely satisfactory.

Completely external examinations are probably essential at the start of any scheme in order that proper standards may be reached and maintained. In the course of time, when standards have become firmly established, the teachers of the school may take some part in examining ; the external element should, however, never be absent, since its presence tends to retain public confidence in the results.

### *The Administration of Vocational Education.*

70. There is no doubt that the system of vocational education is so closely related to that of general education that it should be under the same administration and control. We recommend therefore that it should be administered by the Department of Education in each Province, although, for reasons given in Chapter VIII, we regard it as more convenient for the present that the Industrial Schools now in existence shall be administered by the Department of Industries.

Since the task of organising vocational education is new to the Departments of Education, and the schools will be for some time in an experimental stage, we are strongly of opinion that the vocational schools to be established shall be maintained by the Governments themselves, and not by voluntary organisations aided by grants. When the schools have reached stability and have an assured place in the educational system, the question of entrusting the responsibility for them to other bodies should be reconsidered.

## CHAPTER VI.

### Education for Industry in Vocational Schools.

71. We have already discussed in Chapter III the characteristics of industry and commerce which are relevant to our inquiry ; and we have described in Chapter V the general features of the vocational schools which we believe to be suitable for meeting the educational needs of boys and young men who propose to follow industrial or commercial careers. Our present

task is to consider broadly how the schools we have described can be used with advantage both to industry itself and to those engaged in it. The discussion of education for commerce we leave to a later chapter.

It will be convenient if we deal separately with the schools preparing for work in agriculture, the small scale industries, and organised industries respectively.

*Education for Agricultural Employment.*

72. Education for rural life, like rural life itself, stands apart from other activities. It is true that it includes the same elements as do other branches of vocational education, but it is built on a different foundation of experience. It is quite possible for a youth to defer his choice of a career until he has passed through the Higher Secondary School, and afterwards to become a successful engineer, or chemist or doctor ; but if he is to become a successful cultivator, he will, as a rule, have made his decision far earlier than this, as so much depends on his having lived in a rural environment during his early life. The cultivator is usually in intimate contact with the land from his birth until his death ; his work is indeed his way of life. When he begins to study, he brings to his task a vast store of experience and of knowledge gained insensibly during his childhood. What he has to do is to seek explanations of what he already knows, to widen and systematize his knowledge of rural matters, and to learn how to apply this new knowledge to his own practice.

Taking into consideration these facts, and the further circumstance that agriculture is from its very nature carried on by a widely scattered population, we are of opinion that the most suitable form of vocational education for those who are enagaged in it is not of the vocational type, given in schools separated from the schools of general education. It is true that for other industries we regard this separation as desirable, but the conditions and nature of rural education demand, we believe, very special treatment.

73. In earlier sections of this Report, we have suggested that the Rural Middle School should have a bias towards training for agricultural pursuits : what is needed, in our view, is that in each province certain of these schools, situated in suitable centres, should be selected and their course of instruction prolonged by the addition to it of two or three years, thus creating a limited number of Higher Secondary Schools with a specific agricultural bias. We do not think that there should be any clear line of division between the course in the Rural Middle School and that in the Higher Secondary School following it, but rather that the bias which already exists should be strengthened.

*Education for Small-scale Industries and Occupations.*

74. The small-scale industries and occupations are all engaged either in the making of goods or the rendering of services, and these two aspects of the matter demand separate consideration.

The making of goods on the small scale is frequently carried on by handicraftsmen, and the training of these is discussed in a later section of this Report (Section 127), which describes the organization of " Trade Schools "

Many of the services rendered by men working on their own account, or employing a very small number of workers, are concerned with the erection, equipment and repair of houses and other buildings ; and the maintenance and repair of machines, farm implements, motor vehicles and electrical equipment.

In Western Europe, Junior Vocational Schools exist for the training of the personnel to be employed in each one of these services. It is doubtful whether the conditions in India are yet suitable for the establishment of schools concerned with all of them. Two of them are, however, of special importance even at the present time, namely, the maintenance and repair of machines of various kinds, and the electric wiring of buildings. Since both small-scale and large-scale industries make use of men capable of doing work of this kind; the discussion of the vocational schools for training them postponed to the succeeding sections of this chapter in which the educational provision for organised industries is described.

75. There are certain professional occupations which are carried on by individuals, which demand a high degree of previous education before specialisation begins. Amongst these is the practice of pharmacy, for which a vocational education is appropriate. We understand, however, that little progress can be made with the improvement of pharmaceutical education until the practice of pharmacy is confined, as it is in many other countries, to persons holding approved certificates.

*Education for Organised Large-scale Industry.*

76. We have already indicated in another section of the Report (Section 23) our opinion that the number of openings for boys aiming at reaching very high positions in organised industry is small ; and we have pointed out that there are already in existence in both the Punjab and the United Provinces institutions which meet quite adequately the present demand for industrial recruits of this grade, and are, moreover, capable of expansion if increased demands are made on them. The pressing need of organised industry in India is not for any considerable addition to the supply of highly trained men looking for managerial posts after having had some experience of industry, but for better trained foremen.

The main question before us, therefore, is whether it is desirable for the Government of the Provinces we have visited to establish fresh types of vocational schools for the purpose of training boys who, if they possess the personal qualities needed, will ultimately arrive at the grade of foreman and will, in any case, be skilled craftsmen ; and, if the reply to this question is in the affirmative, what form should these schools assume.

77. An answer to these questions involves a consideration of the following facts :—

(*a*) A foreman ought to be thoroughly at home in the atmosphere of the workshop, and, in that group of industries which the Indian Industrial Commission termed "manipulative" (Section 21), he should be capable of demonstrating to a workman, if necessary, how a skilled operation should be performed.

(*b*) Familiarity with the works atmosphere and ability to perform manual operations skilfully and quickly are best gained at an age below eighteen.

(*c*) There are already in existence in the Provinces a number of technical and industrial schools which devote a great deal of attention to instruction in workshop practice.

78. In view of these facts, we are not prepared to recommend the establishment of Senior Vocational Schools, with a high age of entrance, for training boys to become foremen in works engaged in the " manipulative group " of industries. These, it will be remembered [Section 21 (*a*) ], include certain branches of mechanical engineering, the pottery and glass industries, textiles and mining, in which, as the Industrial Commission pointed out, " large practical experience is necessary for the supervisor to estimate the working conditions and determine whether the quality and output of the work is satisfactory "

Boys who are to enter industries belonging to this group with the intention of becoming either skilled workmen or foremen, ought to enter not later than the age of sixteen or seventeen if they are to achieve their aims. To postpone entrance to these industries to a later age is to run the risk of being too " set " for complete success.

We recommend accordingly that the normal method of training for this grade of work in the " manipulative group " of industries should be that provided by the Junior Vocational School.

79. As regards the " non-manipulative group of industries ", *e.g.*, the manufacture of sugar and of chemicals, and oil and rice milling, we are in agreement with the view of the Industrial Committee that " on account of the automatic or semi-automatic character of the plant, or of the simplicity of the process, the necessary knowledge can be more quickly acquired ". The Commission expressed the view that the only training that can be given for the non-manipulative group is " mainly technological, consisting, for example, of a course in industrial chemistry of a special type, together with some training in the handling of machinery and in the making of drawings " They added that although the student who intends to enter one of these industries will require practical experience, this need not be obtained at a very early stage in his career.

These facts indicate the desirability of establishing in suitable centres Senior Vocational Schools preparatory to work in supervisory positions in the industries belonging to this group.

We deal later (Chapter XI) with the setting up of a Printing School belonging to this grade.

### *The Junior Technical School.*

80. The main type of Junior Vocational School which we recommend is the " Junior Technical School ", which aims at giving a boy such a realistic pre-apprenticeship education that when he enters a branch of industry in which machinery is made or used, or indeed almost any branch dependent on the application of science to industrial practice, he rapidly becomes a

skilful and reliable workman. It does not make him into a skilled workman, but it undoubtedly imparts to him the knowledge and skilll on which his training as a workman can properly be based. Wherever this type of school has been established in England, it has been conspicuously successful in the accomplishment of its aims. The Committee on Education and Industry, for example, reporting in 1928, said "We have heard very warm praise of the work of the Junior Technical Schools which, although they are a comparatively recent creation, have won the approval of employers and educationists alike"

81. It was originally planned to give a preliminary education suitable for boys who are to be skilled workmen. But it has done more than this, for many of the former pupils of Junior Technical Schools, who have continued their studies in part-time technical classes, are occupying responsible posts in industry as foremen, draughtsmen and in some instances, as managers. It should be added that we know of pupils who have successfully completed the course of instruction in a Junior Technical School adopting careers quite different from those for which they have been prepared, and filling them with distinction, not only because of the special knowledge they have gained, but also on account of the attitude towards work they have acquired and the habits of diligence, exactness and self-reliance they have developed.

82. Although this type of school is peculiar to England and Wales and has few, if any, analogues either in other parts of Great Britain or in any of the continental countries we have visited, we believe that its establishment in India would be of great advantage to this country also. We are strengthened in this belief by the opinion of the responsible officers, both Indian and European, of great industrial undertakings in India with whom we have discussed the question of the future of vocational education here. All of them are of opinion that the skill of the rank and file workers in organised industry ought to be increased and that this is impossible unless the educational system includes means of training skilled artisans, from whom a proportion, who possess the necessary personal qualities, can be selected for work as foremen, charge hands, tool makers and the like.

83. The improvement of the qualifications of the foremen and charge hands appears to us to be the great need of a country which aims at increasing the volume of large-scale industry inside its boundaries. Accordingly we attach very great importance to the replacement of some of the High School courses in the Provinces we have visited, by well-planned instruction of the Junior Technical School type. This should not, however, be undertaken in a haphazard way. Before a school of this kind can be established and successfully carried on in any area, a survey of the needs of the local industries must be made in order to learn how many pupils of the school they can absorb each year ; and it is desirable that the employers in these industries should be asked, at any rate in the earlier years of the existence of the school, to undertake to recruit annually a specified number of those pupils who complete the course satisfactorily. When the school has been in existence for some time and has acquired stability, we do not think that any such undertaking will be necessary, as in our opinion, its old pupils will have given such a good account of themselves that boys with similar training will be accepted in preference to others.

84. Junior Technical Schools are appropriate in industrial centres, only and it will be unwise to establish them unless the areas from which they draw their pupils have a population of at least 50,000. The corresponding figure in England is about 30,000, but it has to be remembered that that country is far more industrialised than India.

*The Age of Admission.*

85. It is important that the Junior Technical School shall not be regarded as an institution for boys who have not the ability for following the High School course successfully, and for this reason we think it desirable to prescribe an entrance age which does not exceed $15\frac{1}{2}$ on the first day of the school year. As the schools gain experience and become generally recognised as constituting an essential part of the educational system, we recommend that the age of admission shall be lowered until it does not exceed $14\frac{1}{2}$.

*The Curriculum.*

86. Before describing the curriculum of the Junior Technical School, it is necessary to set out broadly what kind and degree of knowledge will be of use to a boy when he enters the workshop, whatever the nature of the organised industry or the particular occupation he chooses. The chief factors to be considered are :—

(*a*) Every skilled workman is the better for having the ability to perform workshop calculations. The value of this needs no argument.

(*b*) He should have a sound knowledge of, at any rate, the elementary scientific principles underlying workshop practice, that is, of the elements of mechanics, of heat and of electricity he should have, in addition, an acquaintance with the phenomena of combustion and the properties of water.

(*c*) He should understand "the language of the engineer", that is, he should be familiar with the principles of geometrical projection and be able to "read a drawing" If he can also make dimensioned hand sketches of simple machine details, this will be of considerable advantage to him throughout his career.

(*d*) Skill of hand and accuracy of workmanship are of the greatest importance to every workman, whatever his occupation, and this can best be obtained by practical experience in the school workshop and in the laboratory. We understand that in India the habit of working to very fine measurements is comparatively new and is not yet widespread : For this reason, the future workman should become accustomed, from the very outset of his vocational training, to working to measurements as exact as the nature of the material and the character of the task permit or demand this point should be borne continuously in mind both in the workshop and in the laboratory.

The skilled workman should possess an intimate acquaintance with the working qualities of the various materials which he uses, and this can be begun through guided experience in the school workshop.

(*e*) Finally, every one, both in industry and outside it, should be able to express his thoughts readily and clearly, both orally and in writing in addition, he should be able to understand and transmit instructions given to him either by word of mouth, or in writing, or, as is suggested above, in the form of dimensioned drawings.

87. Having all these factors in mind, it is now possible to decide upon the following approximate allocation of time to the various subjects of the curriculum of the Junior Technical School during the first two years of the course. They are as follows :—

| Subject. | | Approximate number of hours instruction each week. |
|---|---|---|
| Mathematics | | 5 |
| Science | | 5 |
| Technical Drawing | | 5 |
| Workshop Practice | | 5 |
| Language (English) | | |
| Other Subjects | | |
| | Total | 30 |

The subjects unspecified in this list ought certainly to include physical training and might include art also.

Details of the syllabus in each of the main subjects of the curriculum, which are those actually followed in a typical Junior Technical School, in England are given in Appendix I. Little comment on these is needed, as they are self-explanatory. It should be stated, however, that in our opinion the whole of the instruction, except that in English, should be given in the vernacular, although technical terms (*e.g.*, "specific heat") should be given in their English form, since some pupils who prolong their studies after leaving school will wish to read textbooks written in English. As regards English itself, we would repeat here the opinion we have expressed elsewhere, that no attempt should be made to give the pupils an appreciation of literary style : they should be taught that variety of language which is used in the ordinary affairs of life.

### *The Third Year Course.*

88. A number of the pupils of a Junior Technical School will no doubt leave at the end of the second year, and if they have secured suitable employment then, no obstacle should be placed in the way of their taking it up, as those of them who have been diligent will certainly do credit to the school. Some pupils will, however, wish to extend their course by another year, and

for these there should be some degree of specialisation in the direction of a particular branch of industry.

89. There is no doubt that in every area we have visited, there is need for a supply of men better trained in general engineering practice, who can be entrusted with the maintenance and repair work of garages and of larger works: and, with the increasing use of electricity for power and light, the demand for trained electrical fitters is bound to grow. The Junior Technical School can therefore begin with confidence to give specialised training in its third year's course in these two branches of industrial knowledge. In doing so, it will continue the instruction in mathematics, Technical Drawing, Science and workshop practice, but will necessarily modify these—and particularly the last—in accordance with the specific requirements of the pupils.

90. In some areas, where textile spinning and weaving are of importance, special instruction should be provided in the third year course for those intending to enter these branches of industry. In these cases the course will diverge far more from that provided in the first two years than in the case of general Engineering Practice and Electric fitting, for the pupils are beginning to study the properties and behaviour of an entirely new material. A suitable distribution of the time available would be :—

| | hours per week |
|---|---|
| Mathematics | 2 |
| Mechanics (including the study of mechanisms) | 3 |
| Engineering Workshop | 3 |
| Textile spinning | 8 |
| Textile weaving | 8 |
| Chemistry | 4 |
| Economics of Industry | 2 |
| Total | 30 |

91. Still another branch of instruction which might be of value in some areas is that in " Light engineering ", which we have seen carried on with success at the Lucknow Technical Institute. It includes the training of boys who wish to become repairers of clocks, watches, sewing machines, gramophones and similar small instruments or machines. The first two years of the Junior Technical School course would form an excellent preparation for specialised training in this work, which has the very great advantage that it develops the qualities of accuracy and exactness in the students. It should be added that there is not scope for many courses of this kind in either of the Provinces visited. It is indeed probable that the course at Lucknow is all that is needed in the United Provinces, and that the establishment of another in the same Province would tend to diminish the stability of this ; but it is likely that a course in light engineering would serve a useful purpose in the Punjab, where Lahore appears to be the most suitable centre.

We realise that light engineering is not a " Large-scale " industry, but we have nevertheless included reference to it under this heading, since the training for it is so similar to that needed by those entering organised industry.

*Atmosphere of the Junior Technical School.*

92. We think it worth while to quote an extract from one of the publications of the Board of Education, which describes clearly the 'atmosphere' of the Junior Technical School :—

> "The Junior Technical School is pervaded by an 'atmosphere' readily perceived by the visitor but difficult to convey in words. The pupils attack their work with a seriousness and satisfaction not always found in schools for pupils of their age. They concentrate because they are interested, they are interested because they have no difficulty in realising the direct bearing of their work on their future lives. They have the air of knowing exactly what they are doing, and exactly why it is worth doing. From the purely educational point of view, this is the most interesting and satisfactory feature of the work of these schools. If a cultural education means an education which cultivates to the fullest extent the latent powers of the pupil, so as to fit him to take his place, as a self-respecting citizen, in a community worthy of his membership, the unprejudiced visitor to the Junior Technical School will admit that it is giving a more truly cultural education than many institutions which make greater pretensions in this respect. By setting up high standards of skill and accuracy, the school imparts to its pupils a strong sense of individual responsibility; by cultivating a pride in good craftsmanship, it lays a sure foundation for self-respect and respect for fellow workers; by appealing to the deep desire of adolescence for a definite place in the world of adults, it is able to awaken intellectual interests which persist and grow long after school days are over."

*Staffing of the Junior Technical School.*

93. It is advisable that the principal of the Junior Technical School should be an engineer who has had both a university training and actual experience of industry. He should have a university degree, in order that he may possess a status equivalent to that of the principals of the Higher Secondary Schools, whose work is parallel to his own; and good industrial experience is necessary for him if he is to gain the confidence of the industrialists with whom he comes into contact in the course of his duties.

The qualifications of the staff assisting the principal will naturally be determined by the nature of the subjects taught. A proportion of the assistant staff should, however, have qualifications of the same kind as those of the principal, partly because of the need for first-rate instruction in science, technical drawing and workshop practice, and partly because it is desirable, especially in the early stages of what we hope will be an expanding system of vocational education, to have a "pool" of suitable men as assistants, from which the future principals of Junior Technical Schools can be drawn.

*External Relationship of the Junior Technical School.*

94. Although the Junior Technical School is undoubtedly a part of the educational system, it can be regarded with equal propriety as part of the

industrial system of the country. It is, in fact, a link between the two systems and it is highly important that this should never be forgotten. The principal must therefore keep in close touch, on the one hand, with the headmasters of the schools from which his pupils are drawn, and must make himself responsible for keeping them informed of the qualities and attainments which he looks for in the candidates for admission to his school. He must, on the other hand, take every opportunity of meeting members of the various firms in his neighbourhood who are potential employers of his pupils, and of learning both the nature and the volume of their requirements in the way of recruits. He can indeed do much, as experience in England has shewn, to "place" his pupils in satisfactory employment at the end of their course, if he has established the right kind of relationships with prospective employers.

*The Senior Technical School.*

95. The Senior Technical School will normally devote its attention to the vocational education of boys who have had a prolonged general education and intend to enter one of the "non-manipulative industries" with a view to holding a supervisory position. For these industries, the educational qualifications of those above the rank and file are a good knowledge of chemistry and of the way in which it is applied to a branch of industrial practice, experience in the handling of machinery, and an ability to make and understand technical drawings.

96. These requirements point to the need for including in the curriculum instruction in physics, since this subject is of use from two points of view; it gives the student that fundamental knowledge of heat and electricity which is so often essential to the economical use of mechanical or electrical plant; and it is so closely related to chemistry that it assists the profitable study of this subject.

Chemistry must necessarily be included. In its early stages, it should be mainly a continuation of the study of this subject made during the High School course, since what is desirable is, first of all, a sound acquaintance. with its principles. In the second year, students may be taught how these principles are applied in practice to the problem of a branch of industry.

Mathematics, mechanics, machine drawing and instruction in a meta workshop are the remaining subjects of the curriculum; they may well be taught to about the same standard as is reached in these subjects in the Junior Technical School. In the subject of mechanics, however, it would be of advantage to include lessons in mechanism, that is, in the methods of transmitting power and of converting one kind of motion into another. Some attention should also be paid to giving the students an elementary acquaintance with the production and application of electricity.

## CHAPTER VII.

### Education for Commerce in Vocational Schools.

97. This branch of vocational education differs so greatly from education for industry that it demands separate consideration. It must be so framed as

to meet the needs of both the two main groups into which we have divided workers in commercial occupations, that is, (*a*) of the group of which the members have the responsibility for transacting business on an important scale, or for performing the professional functions of banking, accountancy and the like, and (*b*) of the very large group engaged in recording the transactions of the members of the first group.

*Education for Commercial Responsibility.*

98. We believe that the best education for the business man with great responsibilities over a wide field is one which develops in him certain valuable personal qualities. He needs imagination, initiative, courage, administrative ability, sound judgment of men and things, and, above all, the quality of leadership. None of these can be directly taught in the school, although the school can do much to foster them through its calling for their regular exercise in all kinds of mental and physical activities. If the school is organised as a real society, where students possess privileges only in so far as they are willing to accept responsibilities, individuals amongst them will gain the qualities we have mentioned and will exercise them in the world outside ; and this is greatly to be desired.

We deprecate instruction in such subjects as economics during the earlier years of school life, since their proper understanding demands knowledge and experience of the outer world which the pupils have not yet acquired. In saying this, we are not suggesting that the pupil who is destined to great responsibilities should receive no vocational education ; but in our view all that is necessary for him is sufficient education of this kind to make the path from the world of school to the world of business more smooth.

99. A young man who is practically certain to succeed in due course to the *commercial* control of a business should not be pressed to study commercial and economic subjects if he goes to a university, unless these have an attraction for him. He will, we believe, be better advised to follow his own bent. This liberty of choice should, however, be conditional on his devoting all his energies to gaining such a mastery over his chosen subjects as is consistent with his age and his degree of maturity. Further, he should take an active part in the general life of the university outside the lecture room and the laboratory. The habit of hard work, the flexibility of mind and the ability to co-operate readily with others which are developed by these means will stand him in good stead in his business career, and will, we believe, be just as profitable to him as the study of commercial subjects.

Valuable as is this type of education for those who are born to great responsibilities, it is not equally suitable for young men who have to make their own way in life. Such a course as is given in the commercial departments of universities is better adapted to their requirements, since they have to shew, from the very outset of their working life, that they have exact knowledge which will make them immediately useful to their employers. But the development of the same personal qualities as are demanded of men occupying high posts should not be forgotten.

For those unable to undertake university studies, the Senior Vocational School described later would provide a useful preparation for commercial life, though it is planned for workers on a lower plane. It gives a knowledge of the structure and machinery of commerce, equips those who follow it with some of the forms of skill which are exercised in commercial undertakings, and, if it is properly carried out, ensures the development in them of the right attitude towards the problems they will encounter.

### *Education for Professional Careers.*

100. The professional man engaged in accountancy, insurance or secretarial work in commerce ought to have the same status as the *entrepreneur*, and should possess the same personal qualities, though not necessarily to the same degree. It is more easy to define the kind of vocational knowledge he should acquire, since he deals with a particular aspect of business. His work is ancillary to that of the *entrepreneur* and less dependent, as a rule, on shrewd judgment and enterprise ; he can therefore be entrusted with considerable responsibilities at an earlier age. We contemplate that the vocational education provided for the members of this important group of commercial workers will be quite specifically related to their several professions. It should not be given before they enter employment, but provided in part-time classes which they attend during their " pupilage "

### *The Education of Clerical Workers.*

101. The qualification required of clerical workers is skill in the " office arts ", that is, in shorthand, typewriting, the elements of book-keeping, recording and filing. With this skill should be associated the ability to make quick and accurate calculations, a sound knowledge of geography, and considerable powers of oral and written expression. In addition, they should be able to receive messages and to transmit them correctly, especially when they are given by word of mouth.

If it were not for the fact that so many clerks need a knowledge of English, which can only be acquired by an education prolonged to the High School stage, we should have recommended that the Governments concerned should establish in suitable centres " Junior Commercial Schools ", exactly parallel to the Junior Technical Schools we have discussed. The requirement in so many instances of a working knowledge of English is, however, a factor which cannot be neglected ; and accordingly we recommend that " Senior Commercial Schools " should be established in those centres where a survey of the needs indicates that they will serve a useful purpose. We emphasise the necessity for such a survey, as we are aware that schools preparing pupils for clerical occupations already exist in some centres.

The instruction given in a Senior Commercial School should not be too vocational in character, since what is needed of a clerk is not only skill in the " office arts ", but also alertness, accuracy and a sense of responsibility. The schools should devote much of the time at their disposal to continuing the general education of their pupils. Thus, the study of arithmetic should

be continued, but the examples should, as far as possible, be drawn from commercial practice; short methods of calculation should be taught; and there should be regular practice in mental arithmetic. The plotting of graphs indicating periodical variations in prices, quantities, etc., and the interpretation of such graphs should be included.

At an early stage of the course, an elementary study of accounts should be begun and related very closely to arithmetic; the instruction should aim mainly at giving pupils a sound knowledge of the principles of book-keeping rather than a detailed acquaintance with their application in commerce.

Geography should continue to be taught, but from its commercial aspect, since at this stage of the education of the pupil utilitarian considerations are predominant so far as this subject is concerned. This does not mean that no reference should be made to the physical characteristics of the various regions and countries, but such reference should normally have a bearing on the study of the methods of exchanging goods and services which are denoted by the term "Commerce"

Shorthand and typewriting form a necessary part of the equipment of a very large proportion of clerks, and should therefore be included in the curriculum of the Senior Commercial School. It is desirable that a daily lesson in shorthand should be given to pupils during the whole of the course.

102. An important subject in the curriculum of a Commercial School is that known in England as the "Elements of Commerce", which includes an elementary descriptive account of the structure and methods of commerce, and thus serves to make the transition from school to business less bewildering to the new recruit.

While the object of the instruction in most of the subjects is quite plain, some explanation of what is meant by "the Elements of Commerce" is probably necessary. There is no doubt that a clerical worker will usually do his work more efficiently from his employer's point of view, and with more satisfaction to himself, if he has not only the special knowledge needed for his own job, but also an appreciation of the part he is playing in the organisation of the business as a whole. Accordingly, the pupil in a commercial school should learn something of the structure and methods of business. His instruction should begin with an account of retail trade, since this is usually the simplest form of trade organisation: he should learn how and from what sources the stock is obtained and replenished, and how it is paid for; he should gain a knowledge of the respective advantages and disadvantages of cash and credit trading; and he should be familiar with the calculation of gross and net profits and the relation of these to turn-over and to the amount of capital used in the business.

From a consideration of retail trading, he may proceed to that of wholesale trading, learning of the services this performs to the producer, on the one hand, and to the retailer, on the other.

He should have an acquaintance with the organisation of transport, with the elementary functions of banking, and with the methods of covering risks by insurance.

From this, he can go on to study the typical forms assumed by trading firms—the sole trader, partnerships, joint-stock companies, combines and co-operative societies; and to the characteristics of different kinds of markets—organised and unorganised.

A syllabus of the instruction sometimes provided in "the Elements of Commerce" is included in Appendix II.

It has been found in actual practice that instruction of this kind serves a useful purpose. There are, however, two directions in which its treatment tends to err. On the one hand, the teaching sometimes includes too many abstract conceptions, which are too difficult for the students to understand, owing partly to their lack of the experience necessary to relate them to practice, and partly to their immaturity of mind. On the other hand, the desire for a concrete treatment of the subject occasionally leads to the inclusion of details which have no proper place in the subject, or are unsuitable for teaching in a school.

The more usual defect is abstractness, and the only satisfactory way of avoiding this is to base the instruction, as far as possible, on concrete transactions. The appropriate method is therefore quantitative and descriptive, and the pupils should be helped to understand the procedure adopted in business by an examination of the documents used; but in no case should these be used except to illustrate and to clarify procedure in relation to specific transactions. They should never be made an object of study in themselves, without relation to the transactions they are used to facilitate.

As regards the study of English, a daily lesson is essential if the pupils are to acquire ease and accuracy in its use; but, as in other vocational schools the English taught should be simple, everyday English, such as is used in conversation or in business correspondence. We make this recommendation with some emphasis, as we have seen in India boys striving to understand complicated extracts from Macaulay and other English authors, although they found great difficulty in understanding a simple English sentence, spoken slowly and plainly. What is known as "Commercial Correspondence" should not be taught. If pupils are trained to make clear, adequate and accurate statements of facts or opinions, they will be able to write business letters quite satisfactorily. It is important that the pupils should also be able to transmit a message given to them orally, and accordingly the English lesson should afford practice to them in the transmission of oral messages; this is especially desirable now that the use of the telephone has become so frequent, but it is valuable at all times.

An equally useful exercise is that of writing précis, since it demands both understanding of the passages to be summarised and skill in thes election and arrangement of the points to be included in the summary. This exercise should, however, be postponed until pupils have acquired considerable skill in the use of the language; and care should be taken with pupils of the age of those attending Senior Commercial Schools, that the passages set are simple in construction and free from words not commonly used.

103. If facilities are available, pupils should be taught to file papers and to use the telephone and other parts of the ordinary equipment of an office; but

practice in this may be postponed until near the end of the course, and no definite allocation of time to it need be made.

104. To sum up, the curriculum of the Senior Commercial School should include—arithmetic ; the elementary principles of accounts ; geography ; shorthand ; typewriting ; the elements of commerce ; English.

The allocation of time to the various subjects may be as follows :—

| | |
|---|---|
| English | 7 hours a week. |
| Geography | 2 |
| History | 2 |
| Shorthand | 5 |
| Typewriting | 5 |
| Book-keeping | 2 |
| Arithmetic | 3 |
| Elements of Commerce | 2 |
| Physical Training | 2 |
| Total | 30 |

In schools where it is found that the pupils have already a fair knowledge of English, the time allotted to this subject may well be diminished, since practice in the language is afforded by the lessons in both shorthand and type-writing ; the time saved—which might be as much as three hours a week—may be devoted to geography, which we often found to be a weak subject in the schools we visited, and to history and the elements of commerce.

*Standard of Entrance to Senior Commercial Schools.*

105. Students admitted to these schools should have passed successfully through the full course of the High School, and should usually have passed the Matriculation or other examination taken at the end of Class XI.

*Length of the Course.*

106. The normal length of the course of instruction should not exceed two years, as it is possible for a pupil of ordinary intelligence, who has acquired habits of diligence during his earlier studies, to cover it quite satisfactorily in that time. There is the further consideration that the pupil will probably be 18 or 19 years old at the end of a two-years' course, and by this age he certainly ought to be thinking of entering employment.

*Staffing of the Senior Commercial School.*

107. The principal of the school should have good academic qualifications, since he is dealing with pupils whose general education has been prolonged. If possible, he should have had business experience, which has given him opportunities of observing the practice of commerce, even though he may have gained

it in an industrial rather than a purely commercial firm. The assistant staff will have the qualifications appropriate to the subjects they teach ; but in their case also, experience of business is of advantage, since it enables them to make the instruction realistic by the introduction of examples drawn from the actual practice of commerce.

*External Relationships of the Senior Commercial School.*

108. Like every other type of vocational school, the Senior Commercial School should be constantly in touch with industry and commerce. The contacts made may be formal, through the principal serving on business committees where these exist, or through business men serving on an Advisory Committee established by the school; or they may be informal, through the principal meeting members of business firms socially or otherwise. But whether formal or informal, the relationship of the school, and of its principal and the responsible members of his staff, with business firms and organisations, should be intimate. There is no other method so valuable as this for securing the welfare of the school and its pupils, or indeed for increasing the efficiency ofthe personnel of commerce.

## CHAPTER VIII.

### The existing Industrial and Technical Schools.

*Their Origin and Development.*

109. We have necessarily considered the place to be occupied in a reorganised system of education by the existing industrial and technical schools, whose development was encouraged by the Indian Industrial Commission which reported in 1918. This Commission described the history of the industrial schools engaged in the training of boys for cottage industries and recommended that they should be placed under the control of the Department of Industries in each province, rather than under that of the Department of Education. They made the same recommendation with regard to the training of the supervisory class of workers in organised industries, and set out a scheme of engineering training which they considered could be applied, as opportunity served, to the case of other large-scale industries.

At the time when they reported, the industrial schools in both the Punjab and the United Provinces were administered by the Department of Education, but those in the latter area were inspected by the Director of Industries, who " practically controlled " them.

110. In making their recommendations, the Commission did not belittle the importance of general education, for they stated (Section 142 of their Report) :—

> " A factor which has tended in the past to delay the progress of Indian Industrial development has been the ignorance and conservatism of the uneducated workmen. The evidence tendered by employers was almost universally in favour of labour, both skilled and

> unskilled, that had at least received a primary education. This is given in countries with which India will have to compete and is a *sine qua non* in this country also."

After quoting examples of employers providing primary, and in some instances elementary technical education, they went on to say :—

> " But we are not prepared to declare that the education of their labour is a duty of employers as such, and while we strongly endorse the views of employers of labour regarding the fundamental necessity of providing some form of primary education for the artisan and labouring population, we are opposed to any scheme which would compel individual employers to provide such education. "

Accordingly, they recommended that government should consider the desirability of introducing into primary schools a form of teaching which would include drawing and manual training as a means of developing in the pupils a practical industrial bias" It appears therefore to have been the view of the Commission that pupils intending to go into industry should do so at the end of their primary education, and that even at this early stage their future occupation should have been borne in mind.

111. The result of this recommendation was the transfer in 1925 of the industrial schools in the Punjab, which had not been very successful, to the Department of Industries, the intention being to train literate craftsmen in traditional callings, such as carpentry, smiths' work, weaving, lacquer turning, coppersmiths' work and the like. With this end in view, the schools were completely re-organised. Their primary departments gave instruction in the ordinary subjects, but included drawing and kindergarten work ; in the Middle departments, the pupils spent half their time in learning arithmetic, Urdu, elementary geometry, science and freehand, model and technical drawing, while the remaining time was devoted to gaining skill in one of the trades mentioned above.

112. It is by no means certain that the recommendations of the Commission were really carried out, as there may have been some misunderstanding of the term " primary education " In England, this was formerly used very commonly to denote that grade of education which began at the age of five and was completed at the age of thirteen, while it is employed in the Punjab to denote the grade which ought to be completed by the age of ten or eleven. It seems probable that the Commission were using the English rather than the Indian terminology.

If this interpretation of the recommendations of the Commission is corrects the plan adopted in the Punjab introduced trade instruction into the schools four years earlier in the life of the child than was intended by them. That it is correct is, we think, borne out by the further statement they made (Section 178) that " in the case of industrial schools, where craftsmanship is the all-essential feature of the training, the small amount of general education can easily be supervised by any person of ordinary intelligence, whilst the teaching of craftsmanship must be provided and controlled by an agency which knows from practical experience the type of employee required by an industry, and can judge if the requirements have been fulfilled."

113. The Commission did not, however, regard the industrial school, even when conducted, as they suggested, under the control of the Department of Industries, as likely to be very successful in the achievement of its aims, for they said (Section 144) :—

> " The Industrial School is at best a defective instrument of education owing to the non-commercial conditions under which it must necessarily be carried on. In spite of this, it seems to be the only means by which the indigenous artisan can be trained, though in the past, through his ignorance and lack of education, and through the imperfection of their equipment and teaching staff, Industrial Schools have failed, in the majority of cases, to achieve any appreciable results. While, therefore, the institutions are to be encouraged within the limits specified, we regard them as altogether unsatisfactory if employed to train artisans for organised industries."

We are in agreement with the views of the Industrial Commission as to the inherent defects of the Industrial School carried on under the conditions they mentioned, that is, when it is conducted under non-commercial conditions, for pupils who have had little or no previous education, with imperfect equipment, and by teachers who are not well-qualified. It is clear, however, that if these known obstacles are removed, the Industrial Schools will have a far better chance of success. We return to this point later.

*Industrial Schools in the Punjab.*

114. Experience shewed that in the Punjab the schools were popular, and in most instances had more applicants for admission than could be accommodated. Few Schools had less than a hundred pupils ; many had three hundred ; and one had as many as seven hundred.

115. In 1932, it was decided by the Ministry of Industries in the Punjab to stop recruitment for the schools, partly because they had led to no industrial development, which indeed was not surprising, and partly because it was thought that the average carpenter and smith were sufficiently well equipped for the trades they followed. In this Province, the schools were in future to work on a productive basis, the boys were to be regarded as apprentices, and an attempt was to be made to introduce new industries rather than to consider the needs of industries already existing.

This decision was one of great moment, for it changed completely the aim of the institutions which it affected. Under the previous conditions, they had been *schools* whose main object was the preparation of boys to begin work in artisan occupations at the age of 13 or 14 ; under the new conditions, they were bound to be primarily *productive workshops* for older boys, rather than schools, though, from the fact that the boys were to be regarded as apprentices, the educational aspect of the institutions was not to be overlooked. It is true that in the Punjab, they are still called " Schools ", but that term does not convey an exact description of their function. They make and sell goods just in the same way as an ordinary factory, but differ from this in three respects. In the first place, the work is done by apprentices working under the direct and close supervision of a number of teachers skilled in the crafts practised ; in the second

place, the apprentices are given theoretical instruction relating to the trade they are learning in very much the same way as apprentices in European works who are given " time off " during working hours, in order that they may attend school; and, finally, they are in receipt of State subsidies.

116. The existing industrial schools of the Punjab are engaged in training boys in hollow-ware casting (using local materials instead of those imported from other Provinces), tailors' cutting and fitting, the making and repair of sewing machines and of hosiery machinery, die sinking, hosiery manufacture, weaving and dyeing, woodworking, the making of folding furniture, tool making, lock making and the manufacture of agricultural implements. It will be noted that this list includes training for both crafts—such, for example, as tailor's cutting and fitting—and for work in organised industries, such as the making of sewing machines and hosiery machinery.

### *Industrial Schools in the United Provinces.*

117. Although technical education has been provided on a small scale for many years in the United Provinces, it was not until recently that any considerable expansion took place. In 1910, there were only four Government schools in these Provinces teaching vocational subjects, but this number had by 1931 increased to thirty, while in addition there were 66 grant-aided schools carried on by local bodies and private organisations. Some of these schools have now been closed, with the result that there are at the present time 25 Government institutions and 47 institutions aided by grant.

118. For general purposes, the Government institutions are classified as follows :—

*First Class.*

(*a*) Harcourt Butler Technological Institute, Cawnpore.

(*b*) Government Technical School, Lucknow.

(*c*) Do. Gorakhpur.

(*d*) Do. Jhansi.

(*e*) Government Textile School, Cawnpore.

(*f*) Government School of Arts and Crafts, Lucknow.

(*g*) Government School of Dyeing and Printing, Cawnpore.

(*h*) Government Carpentry School, Allahabad.

(*i*) Central Wood Working Institute, Bareilly.

(*j*) Central Weaving Institute, Benares.

(*k*) Leather Working School, Cawnpore.

(We were able to visit all these school except those at Gorakhpur and Jhansi.)

*Second Class.*

(*a*) Metal Working School, Aligarh.

(*b*) Batuk Prasad Khattri Industrial Institute, Benares.

(*c*) Leather Working School, Meerut.

(*d*) Weaving and Cloth Printing School, Bulandshahr.

(*e*) Tanning School, Fatehpur.

(*f*) Carpentry School, Dehra Dun.

(*g*) Do. Naini Tal.

(*h*) Do. Fyzabad.

*Third Class.*

The "Model Weaving Schools" at Muzaffarnagar, Khairabad, Najibabad, Almora, Agra and Mau.

Although this classification is based on the qualifications and rank of the principals of the schools, as well as on the grade of work done, we are inclined to agree with the Director of Industries of the United Provinces that it is preferable to classify the different institutions in accordance with (*a*) the initial qualifications of the pupils in attendance and (*b*) their expressed aims. The schools would thus be divided into :—

(*a*) *Trade Schools*, where boys are trained for employment as handicraftsmen by following what is, in effect, an apprenticeship.

(*b*) *Industrial Schools*, which prepare their students for working on their own account in small-scale industries.

(*c*) *Technical Schools*, in which students, after a sound education in the principles underlying industrial practice, are equipped with knowledge which will fit them for responsible industrial posts.

If, however, this classification is adopted, it is not easy to follow it exactly in drawing up a list of schools, since the same school, *e.g.* the Central Woodworking school at Bareilly, would find a place under at least two of the headings. Nevertheless, the classification appears to us to be sound.

### *Organisation and Equipment of the Schools.*

118*a*. In spite of any criticisms of the system we may have to offer, we wish to say at outset that we have been favourably impressed by the work of the organisers and many of the teachers in the schools, and by the skill gained by the pupils. We ought to make special mention of the sketches and working drawings made in the schools where these are appropriate, as they frequently reach a very high standard.

Th equipment of the Industrial and Technical Schools is usually excellent, and compares favourably with that found in many European schools with the same aims as these.

*Staffing of the Schools.*

119. The staffing of the schools is on a liberal, and occasionally on a lavish scale, and the various teachers appeared to us to be suitably qualified for the work they are called upon to do. Some of the principels of the schools are undoubtedly men of outstanding ability, whose services will be of great value in any future development of vocational education in India.

*Annual Expenditure on Trade, Industrial and Technical Schools.*

120. We have made inquiries as to the annual cost of the various industrial and technical schools in the two provinces, with the result shewn in the following tables* :—

*Punjab.*

| Name of Place. | No. of pupils. | Budget estimate. | Average cost per pupil. |
|---|---|---|---|
| | | Rs. | Rs. |
| Amritsar | 8 | 7,657 | 957 |
| Ferozepore | 57 | 14,478 | 254 |
| Gujranwala | 40 | 13,614 | 340 |
| Jhelum | 18 | 11,248 | 625 |
| Jhang | 68 | 11,003 | 162 |
| Kasur | 30 | 12,535 | 418 |
| Kulu | 19 | 5,373 | 283 |
| Ludhiana | 20 | 17,066 | 853 |
| Lyallpur | 67 | 19,355 | 289 |
| Muzaffargarh | 40 | 9,021 | 225 |
| Rawalpindi | 75 | 12,672 | 169 |

*We understand that in the estimate and statement of net expenditure no account is taken in the Punjab of the capital expenditure on equipment.

*United Provinces.*

| Name of Place. | No. of pupils. | Actual net expenditure. | Average cost per pupil. |
|---|---|---|---|
| | | Rs. | Rs. |
| Agra | 13 | 2,212 | 266 |
| Aligarh | 56 | 13,441 | 222 |
| Allahabad | 194 | 51,598 | 266 |
| Almora | 9 | 4,343 | 482 |
| Bareilly | 175 | 72,050 | 411 |
| Benares | 106 | 16,405 | 155 |
| Bulandshahr | 26 | 14,997 | 576 |
| Cawnpore | 267 | 2,32,197 | 869 |
| Dehra Dun | 20 | 6,676 | 333 |
| Fatehpur | 23 | 6,683 | 290 |
| Fyzabad | 13 | 8,912 | 684 |
| Gorakhpur | 209 | 45,088 | 215 |
| Jhansi | 70 | 20,209 | 289 |
| Khairabad | 14 | 4,388 | 313 |
| Lucknow | 344 | 1,30,998 | 381 |
| Mau | 18 | 3,872 | 215 |
| Meerut | 39 | 11,502 | 294 |
| Muzaffarnagar | 15 | 4,672 | 311 |
| Nainital | 194 | 51,598 | 266 |
| Najibabad | 12 | 4,749 | 395 |

121. These costs are certainly high in comparison with those contemplated in the report of the Indian Industrial Commission, which stated* :—

"The five Government Schools of Art train 1,310 pupils at a cost of Rs. 2,61,314, which works out almost exactly to Rs. 200 per head.

*NOTE.—It is of interest to compare these costs with the average cost per pupil in 42 Junior Technical Schools in England. In 1936, this amounted to £23-2-0 (Rs. 308) per pupil.

The Government technical and industrial schools, which are really all industrial schools, are 38 in number and train 2,431 students at an average cost of Rs. 160 per head. Those under private management aided by Government are 85 in number and train over 4,000 students at an average cost of Rs. 177 per head. These are mainly mission schools."

"These average figures are not of much value, as they relate to institutions of very different merit. In all these schools some part of the receipts is derived from thc sale-proceeds or work done in the school by the pupils, and in the better-managed schools this is an important source of income. Taking this into account, we think that industrial schools can be run at an average cost per pupil of Rs. 200 per annum, and that they can be established with a capital of Rs. 500 per student. Ordinarily, schools should not train more than 100 pupils at a time."

122. It has to be remembered that the Industrial Commission reported in 1918, when the purchasing power of money was greater than it is now and further, that they were not thinking so much of "technical" as of "industrial" schools, which would derive some income from the sale of the goods they made, and thus diminish their net expenditure. Even taking these important factors into consideration, there is no doubt that some of the schools are more costly than they ought to be, although the schools doing very advanced work as well as the larger institutions mentioned in the list are, we believe, justifying the expenditure they involve. We suggest, however, that the Departments concerned with the control of industrial and technical education should review the expenditure carefully. In particular, we recommend that they should consider the advisability of—

(*a*) Concentrating the instruction into a smaller number of institutions, and

(*b*) raising the standard of entrance to some of the schools, and thus diminishing the length of time spent in them by each student.

*The Policy of Concentration.*

123. It was obvious to us in some of the schools we visited that the teachers could, without any inconvenience, have handled larger numbers of students than were in attendance in their classes. Continued efforts are needed to make these schools more popular, in order that the number of pupils in each class may be enlarged within reasonable limits until it reaches what may be termed "an economic size"

124. In visiting the Industrial Schools, we noted that the majority of them approximate to "monotechnics", that is, each of them teaches a limited range of industrial subjects, or, in some instances, only one subject. Further, we have been struck by the fact that some schools lack permanence; they train a number of pupils who wish to enter a particular branch of industry, and abandon their work as soon as the supply of these is no longer forthcoming. We have heard, too, of cases where a local desire has been expressed for the establishment of a particular form of trade instruction and the Department

concerned has made arrangements for meeting this, only to find that few or no pupils presented themselves.

In addition to these difficulties, it is sometimes found that suitable premises are not available in an area where instruction is really desired.

125. Even where these obstacles are not encountered, the monotechnic type of organisation, although it may involve smaller initial capital expenditure on buildings, has several disadvantages :—

(a) It leads to increased annual expenditure, since certain service—supervision, clerical assistance, motive power and cleaning—are necessarily duplicated to some extent ; the same may be said of the expenditure on teaching since it is impossible in a small institution to group together for certain subjects pupils taking different courses which have nevertheless a common basis.

(b) A small monotechnic, situated perhaps in an obscure part of a town, does not strike the public imagination in the same degree as a larger institution, accommodating classes in a wide range of subjects, undoubtedly does. For example, it is probable that few persons except those immediately concerned know the brass-working school in the bazaar of Benares or, at any rate, are acquainted with the quality of the work it does, while the public generally would be interested in a polytechnic institution in the same city, if it provided education for a large proportion of the important trades carried on there. We are well aware of the difficulties—financial and other—of providing suitable accommodation in one imposing building in each great city for the variety of trades carried on within it. At the same time, we think it necessary to indicate what we believe to be the ideal to be approached ; and we are not without hope that in the re-organisation of the educational system which is now under discussion, some of the great cities of the Provinces we have visited will find it possible to utilise the premises of an existing school for the purpose of providing under one roof most of the vocational education needed by the community. It is impossible to suppose that the present provision of education in tachnology and art in the greater industrial town we have seen will be adequate for future demands, if the intention to develop ogranised industries in India is fulfilled ; the authorities concerned should therefore take a long view.

*Raising the Standard of Admission to Industrial and Technical Schools.*

126. We have inquired as to the minimum qualifications required of candidates for admission to industrial and technical schools and learned that, in certain classes intended for purely manual workers, the ordinary standard prescribed is that of the Eighth Class, while in other cases, where the foundation of general education must be more complete, the standard required is that of the Matriculation examination. In such an institution as the Harcourt Butler Technological Institute, it is necessarily much higher, as the work done there is mainly post-graduate in standard.

During our visits, we frequently found that pupils who had left school below the Eighth Class were admitted to Trade Schools and to artisan classes generally. In other instances, the students in the Industrial and Technical Schools were considerably older than we should have expected from the conditions laid down for admission to the School. In the case of matriculated students, the reason is, we understand, that some of them after trying without success to obtain a post in commerce or in Government service, have joined an industrial school in the hope of qualifying for a career different from the one they had originally contemplated and on which their ambitions were set. Such students cannot usually furnish the best material, either for the industrial schools or for industry itself, especially if they have not included science in their matriculation course. We may refer incidentally here to the late age at which a number of young men enter industry. It is often surprisingly high. A student who has passed the matriculation examination at the age of sixteen or seventeen, and then spent a year or so in looking for a job before entering upon the course of an industrial or technical school must be not far short of 22 years of age before he enters industry and begins to earn his living and in general this is not satisfactory, either from the point of view of the employee or of the industry in which he is employed.

The most effective preparation for successful work in an industrial or technical school is either the High School course up to matriculation standard, with a good grounding in mathematics and science, or the course of the Junior Technical School which we have described in Section 80 *et seq.* The former is preferabe for students who think of entering an industry like dyeing, which depends so much on a knowledge of chemistry and physics, while the latter is the more suitable for students who desire to enter industries where machinery is largely used; for there can be no doubt that a boy who has gained a sound knowledge of mathematics, of science and of the principles of geometrical projection, and has been taught either wood work or metal work in a properly equipped workshop, will very quickly learn to apply his knowledge and skill to those numerous branches of industry where they are of fundamental importance. Indeed, we are of opinion that by making the Junior Technical School the normal method of approach to the Industrial School which prepares for the non-chemical industries, the length of the course in the latter type of school could be cut down by at least one, and possibly by two years. This would be a great gain, since it would diminish the expenditure on the individual student in the Industrial School. It would have the additional advantage, whose value it is difficult to over-estimate, that the student would begin to earn wages earlier in life, when he is still young enough to be influenced greatly by the businesslike atmosphere of the workshop.

*Trade Schools.*

127. Following the definition of the function of the Trade School given in an earlier section [Section 55(*c*)], we may regard this type of school as constituting a form of apprenticeship for boys who intend to qualify as handicrafts men and will, as a rule, belong to the employed rather than the employing classes. They will need less instruction therefore relating to costing, the conduct of business and the keeping of accounts.

A competent craftsman should be thoroughly acquainted with his raw materials, whether of wood, metal, leather, textiles or other material, and with their working properties. He can gain this by no other means than that of utilising the materials for the production of objects either by hand or with the help of simple tools. He should have great skill of hand and eye; this again comes only with long practice. He should possess at least an appreciation of art, and if he has the necessary gifts, some skill in designing this means that he should have received systematic training in art.

128. In view of all these requirements, we should have preferred to recommend that entrance to Trade Schools should be made conditional on the passing of the First Public Examination which it is proposed to institute at the end of Class VIII, since we believe that the first requisite of every skilled workman is a general education up to at least this stage. We recognise, however, that the insistence on such a standard of preliminary education would, in present circumstances, result in the schools having few or no pupils.

We recommend therefore that, for the time being, pupils admitted to this grade of school shall have reached a class not lower than Class VI; but in making this recommendation, we urge, first, that exceptions to this rule shall not be made in any circumstances; and, second, that when the conditions become sufficiently favourable, the entrance standard shall be that normally reached in Class VIII.

129. The instruction given in the Trade School usually aims at preparing pupils for entrance to skilled occupations in which manual dexterity is of great importance. It does not, like the Junior Technical Schools, give a training preliminary to employment which will be of value whatever the occupation selected from a range of cognate occupations.

130. The number of schools of this type is large on the continent of Europe, although it is small in every part of England except London. In Paris alone, the Trade Schools of its Chamber of Commerce provide trade instruction for more than seventy occupations, of which the main types are set out in Appendix III.

Trade Schools are of special value in countries where the industrial unit is small, for in a business employing a small group of workers, it is not usually sufficient for the apprentice to rely on learning the craft from the older workers with whom he is associated. It is possible that they may not be familiar with the best workshop practice, or they may be unwilling to teach him, or again they may have little skill in imparting the knowledge they themselves possess. It is because India has so many firms of small size engaged in very diverse branches of industry that the advisability of extending the provision of Trade Schools in appropriate centres should be carefully considered.

131. There is one factor which should always to be taken into account. In no instance should a Trade School be established for training boys or young men for an occupation which is likely to be displaced by some other process, for there can be nothing more unsatisfactory to a man than to find that the skill he has acquired by long effort, and by which he earns his living, has been rendered valueless through the invention of a machine or the introduction of a new process. Examples of the diminution in the value of manual skill will occur

readily to everyone—hand-sewing has been partly replaced by the sewing-machine, as every visitor to a bazaar must notice; and woodworking, hand-spinning and weaving have been to some extent replaced by power-driven machinery. The list of decaying crafts is long, and it is growing longer. It is incumbent, therefore, on those responsible for the establishment of Trade schools, to make sure that the skills they impart will be, so far as can be judged, of permanent value to their possessors. Looking at the various occupations open to workers, there is little doubt that one variety of skill which is likely to remain of lasting value is that employed in the production of goods of artistic merit. There will always be a market for this in any civilised society, though the extent of the market may fluctuate with increasing or decreasing prosperity. For this reason, we are of opinion that if more Trade schools are established, proper regard should be paid to the needs of those crafts whose success depends on beauty of design and skill in workmanship. Amongst these are hand-loom weaving, the making of jewellery, leather goods, lacquer work, furniture and pottery, and the working both of the precious metals and of copper, brass and iron.

132. In addition to these artistic trades, there are others which can appropriately be taught in Trade Schools, such, for example, as the repair of sewing machines and type-writers, tailoring, and boot and shoe making and repair.

133. We regard it as essential to the full success of these schools that they shall devote about one-quarter of the available time to continuing the general education of the pupils, giving instruction in art to those intending to enter occupations where this will be of use, and in general subjects, including arithmetic and reading and writing to every pupil, since a knowledge of these subjects quickly disappears if pupils are not continually called upon to make use of them. The remaining three quarters of the time available should be spent in practical work in the craft, care being taken that the instruction is suitably graded.

### *Industrial Schools and Technical Schools.*

134. We group these two types of schools under the same heading, because we believe that the standard of entrance to both of them should be approximately the same, although their aims are not identical. The former aims at preparing students for carrying on small-scale industries on their own account, while the latter contemplates that its students will ultimately occupy positions of some responsibility in large-scale organised industries.

135. In both types, it is essential in the present position of Indian industries that practical instruction in the workshop shall occupy a very prominent place in the time table. We are informed by many competent observers that the workshop in India is not usually a very good school for obtaining a knowledge of first-rate workshop practice; and this is confirmed by the fact that the number of persons employed in an Indian factory or works is usually far greater than that employed in a works with a plant of the same size in England or on the continent of Europe. In Western countries, where the industrial system is much older, the standard of workmanship is often very high. Although this is by no means universal, it is sufficiently usual in Great Britain, for example, for

the burden of training recruits to industry to be shared between the industry and the school. The industry is expected to give its skilled workers, during their earlier years of employment, good practical experience, while the school devotes itself, in the main, to teaching them the scientific and other principles on which the practice of the workshop is based. The workshop and the school are thus complementary agents, both of which are necessary in the training of the fully equipped worker. On the continent of Europe, this sharing of the task of training industrial recruits is not so wide-spread as in Great Britain, it being a common practice for the school to give both theoretical and practical training. All things considered, we believe that this is, under existing conditions, a plan which is better adapted to Indian needs than is the English plan. Further, we are of opinion, that it will be necessary to adhere to this plan for many years, until, indeed, organised industry has reached a stage of development in India at which the sharing of the burden between industry and school can be adopted without the risk of the standard of craftsmanship being lowered.

135. In general, we are of opinion that the course in the Industrial School should not exceed two years for those of its students who have completed the course in a Junior Technical School before being admitted to this more specialised course.

136. It is desirable that students in the Industrial School shall be taught, side by side with their vocational instruction, such subjects as drawing, mathematics, book-keeping, and what we have termed " the elements of commerce ", since they must be able to deal with clients by sketching for them the work they propose to do for them, to calculate its cost, to keep records of income, expenditure and profits, and to buy and sell skilfully. This kind of instruction may well occupy one-third of the total time spent in school.

137. While the technical school will devote the same attention to training in workshop practice as does the Industrial School, it will devote the remaining time to mathematics, science and technical drawing ; for these constitute the foundations of industrial practice in many of the organised industries. Special attention to exact measurements, and to working within fine limits, should characterise the instruction in this type of school, since accuracy and finish are the marks of good worksmanship and can only be acquired by practice.

*The Harcourt Butler Technological Institute, Cawnpore.*

138. Special mention should be made of this Institution, since it is intended that it shall be a centre for training men who will ultimately be amongst the leaders of the industrial development of the United Provinces. It has three departments, devoted respectively to (*a*) General Applied Chemistry, (*b*) Oil Technology, and (*c*) Sugar Technology, though this last section has now been transferred to the control of the Imperial Council of Agricultural Research.

The equipment for both instruction and research is good, and includes plant for production on the semi-manufacturing scale.

There is a Diploma course extending over two years, followed by post-diploma courses extending over the same period.

In addition to these, which are of a high standard, there are shorter courses requiring at least six months attendance for workers in the oil milling, soap making, and oils, paints and varnish industries.

The qualification for admission to the Diploma courses in each section is the possession of a B.Sc. degree ; the same requirement is made of students attending the shorter courses, except in the case of those taking the Sugar Boiler's or the Foreman Khandsari course, when it is lower.

The staff are well qualified for the work they undertake, and we believe that the institution is performing a most valuable service in equipping men of wide and sound previous education in science for important posts in the industries concerned.

*The Control of the Technical Schools.*

139. There remains for discussion the important question of the control of the trade, industrial and technical schools, that is whether they should be transferred to the Department of Education when this assumes responsibility for a certain measure of vocational, education ; or whether their control should remain, as at present, with the Department of Industries. The latter course was recommended in 1918 by the Indian Industrial Commission, which had carefully considered the various factors to be taken into account in reaching a decision on this point (Sections 178 and 179 of their Report) ; and their recommendation was accepted and acted upon.

140. We are bound to point out that in nearly every great industrial country of whose system of vocational education we have any knowledge (and we have obtained information on this point from more than twenty different countries) technical education and general education are administered by the same Department of State *i.e.*, the Ministry of Education, although this Ministry has, usually, separate sections each dealing with a particular branch of education. Nevertheless, we are not disposed to recommend that at the moment any transfer of the trade, industrial and technical schools should be made from one department to another, though we believe that such a transfer may ultimately be necessary. Our reasons for this conclusion are :—

(*a*) It is not desirable to modify an existing arrangement, which is generally understood and accepted, unless quite cogent reasons exist.

(*b*) The schools, as now organised, are often productive industrial undertakings rather than schools. Many of them buy raw materials, convert them into finished goods and sell the product ; and their aim is, in many instances, to give manual skill rather than scientific knowledge.

(*c*) The Department of Education as yet have no staff competent to inspect and advise on technical education, whereas the Department of Industries in both provinces have officers of suitable experience and knowledge.

(*d*) The industrial schools are aiming, not merely at training students but at developing fresh industries and using new local materials.

With the growth of preparatory vocational education and, as we hope, the development of technical schools of the polytechnic type in India, the conditions will be materially altered and the control of technical education may then have to be transferred, as in other industrial countries, to the Departments of Education. We believe, however, that at present the time is not ripe for this step to be taken.

*Administration of Junior and Senior Vocational Schools.*

141. What we have said about the control of Industrial and Technical Schools does not apply either to Junior or Senior Vocational Schools, whose educational content is so very closely related to that of the Schools of general education. We recommend that they should in each province be administered by the Department of Education.

*The Expert Inspection of Industrial and Technical Schools.*

142. We have noted with insterest the recommendation of the Indian Industrial Commission that there should be "thoroughly qualified visiting experts" for insdustrial schools and that they should be included in the cadre of the Imperial Department of Industries. They say (Section 179) :—

> "We think it necessary, for some time at any rate, to arrange for the provision of a system of regular visits by specialist officers of the Imperial Department of Industries. There is at present in the various provinces no generally accepted tradition of correct methods in these forms of teaching, and we think that local Governments and Departments of Industries would be greatly assisted in their efforts to create one, by occasional visits from Imperial officers, whose functions would be merely advisory, and would be confined to placing their notes and observations before the Local Governments for consideration. The specialist visitors would form a convenient channel for transmission to one province of useful experience acquired by another, and this would enable Local Governments, while retaining complete control of their own industrial and technical education, to profit by the knowledge gained elsewhere"

In a later section of the Report, referring to the same matter, they state that "the majority of industrial schools can be grouped as metal working, textile and wood working schools, a division which would certainly require three experts for each province as inspectors, but it is fairly certain that no one province would be able to find full-time employment for so many men"

143. At first sight, we found this recommendation attractive, but after carefully considering it, we are not disposed to adopt it. Quite apart from possible constitutional difficulties, there is the fact that the area of India is so great and the time occupied in travelling would be so considerable, that inspectors attempting to cover the whole of the country would have insufficient time to devote to their proper work. Moreover, in the present circumstances, it is not only technical efficiency in the teaching that is needed, but also the growth of the right attitude towards training for industry and commerce. Accordingly,

we are convinced that the better plan is for each Province to employ its own inspecting officers, responsible to its own Department, and possessing, as the results of contact with the local industries and the outstanding persons controlling these, an intimate and detailed knowledge of local circumstances and conditions. It is only in this way, we believe, that the development of an effective system of vocational education can be fostered. We ought to record, in this connection, our sense of indebtedness to the officers of the Departments of Industries in both the Punjab and the United Provinces, for it was owing to their detailed knowledge of the industries, and the close relationships they have cultivated with industrialists, that we were enabled to learn as much as we did of the industrial conditions in these Provinces.

144. Machinery already exists for the transmission of useful experience from one Province to another, partly by means of the Bulletin which is issued regularly, and partly by that of the periodical conferences of the Directors of Industries of all the Provinces. The only suggestion for further action of this kind we wish to make is that Deputy Directors and Inspectors of Industrial Schools should be invited to be in attendance at these conferences.

*Industries for which the educational provision is small.*

145. Although, as we have said elsewhere, an industrial survey is necessary before a complete system of vocational education can be established in the Provinces, we ought to refer to certain branches of industry, for which the present provision appears to be inadequate. Amongst these is the building industry, for which there is, so far as we can learn, little provision. It is true that the Government School of Arts and Crafts at Lucknow has classes for architectural students, and that civil engineers can receive training at Roorkee ; but in other countries it has been found of advantage to develop courses of instruction for men actually engaged in the building crafts, that is, masons, bricklayers and especially plumbers, on whom such a great responsibility for the efficiency of sanitation rests. We believe that it would be worth while to consider whether similar instruction would not serve a useful purpose in India also.

146. We were glad to learn that the University of Benares, in addition to its well-equipped department of Engineering, has now facilities for training men for both the glass and the pottery industries, which we hope will result in the supply of competent leaders for these important branches of manufcture. It is desirable that this training shall be associated in some way with the training of designers, since there is no doubt that the value of the products of the industries is greatly dependent on their artistic character.

147. In this connection reference may be made to the possibilty of developing the cutting and engraving of glass as a cottage industry, as is done successfully in some parts of Czechoslovakia with the vigorous co-operation of the schools of art. The desirability of establishing schools for other artistic crafts, *e.g.*, toymaking in the woodworking districts, should also be considered, this particular industry also is assisted by suitable school instruction in Czechoslovakia.

148. Another branch of industry for which only very small provision of technical education exists is printing, although this is carried on on a large

scale in Allahabad, where we had the opportunity of visiting two important works. Since the spread of knowledge and of culture depend to so great an extent on the efficiency and cheapness of printing, we hope that instruction for those engaged in this industry will before long be provided on a suitable scale. The existing methods of recruitment for the industry and some suggestions for their improvement are described in Chapter XI.

## CHAPTER IX.

### Education in Art.

149. Nothing we have observed in the schools we have visited has disappointed us more than the general neglect of the teaching of art, especially as India has such a long tradition of artistic achievement. The country is filled with beautiful monuments ; and the traditional dress, adornments and household utensils in common use shew that the people of India have inherited a high appreciation of form and colour. As a recent writer on India has said " Dress, furniture, architecture, the fine arts and music, give ample scope for the expression and the enjoyment of beauty, and in this sphere India has much to give as well as to learn. It is perhaps of all spheres that in which direct transference is least to be desired. The Indian woman's dress stands out in pleasing contrast to that of her Western sister, in its simplicity, its grace and its almost unfailing charm of colour. Here would be a disastrous field for Westernising experiments."*

There is, we believe, a risk that the artistic traditions of India will become enfeebled, as a visit to any bazaar or an examination of the costly wares displayed in the shop-windows of the larger towns will show. The cheap imported goods are often less beautiful than the products of India, and, as regards the expensive goods, there is a tendency, we understand, for wealthy people to demand furniture of the kind they have seen in the capitals of Europe or in the United States of America. While we believe that it would be a foolish policy to refuse altogether to be influenced by the West or the Far East, we are strongly of opinion that the artistic traditions of India should be maintained and strengthened, since they have their origin, like every other element of culture, in the life of the people of India herself. Physical science, dealing with materials and forces which are the same in one country as another, has no home peculiar to itself it is universal and its laws are immutable, whether they are discovered in Europe or in Asia. Art is different, since although it has a general appeal to people of taste throughout the world, the forms it assumes have a very special appeal in those regions, and to those peoples to which they are native.

150. Quite apart from the cultural value of the development of the national art of a people—and we attach the greatest importance to this—there are other values which we are bound to mention, since our main reference is in respect of vocational education. If India is to utilise her natural resources for the material welfare of her population, she cannot afford to neglect any legitimate means of fostering her industries, and we are convinced that it would be wise to devote far greater attention to the artistic qualities of the goods she produces than she does at present.

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* F. S. Marvin: India and the West p. 123.

*Art as a constituent of general education.*

151. The question of the teaching of art in the Middle and Higher Secondary schools has been dealt with in Part I of this Report. We may repeat here that the time devoted to this subject in these schools is, in our opinion, inadequate for the purpose of either arousing in the pupils any real appreciation of art, or of enabling them to develop any artistic gifts with which nature may have endowed them. The absence of systematic and well-planned instruction in art in the schools of general education handicaps the Schools of Arts and Crafts in their efforts to give a full training to their pupils. Moreover, it is probable that the neglect of instruction in art in the ordinary system of education leads to a waste of talent, since there is no effective means for discovering potential artisitc ability.

*Schools of Arts and Crafts.*

156. We have visited the Mayo School of Arts and Crafts at Lahore and the Government School of Arts and Crafts at Lucknow. It is surprising that these two institutions should be considered adequate for the instruction in art of a population amounting in all, to close upon seventy-five million people.

*The Mayo School of Arts and Crafts* teaches the following subjects :—cabinet-making ; lacquer work on wood ; iron work ; silver work ; brass and copper work ; gold and silver jewellery (including enamelling) ; modelling in clay and plaster of Paris ; commercial painting ; and fine art. The course in lacquer work is for two years only, while that in each of the other branches extends over three years.

In January 1937, the total number of students in all the Departments was 207. No students is admitted without submitting to a test of his ability, unless he has passed the final examination of one of the Industrial Schools of the Punjab, when he may enter without further examination the second year of one of the craft courses. The records of the Industrial Schools of the Province prepared for us shew that a considerable proportion of the pupils in these schools supplement their training by further studies at the Mayo School of Arts and Crafts.

157. Pupils who have had no previous experience of art are admitted to a Preparatory course, which extends over one year and prepares them for admission to one of the craft courses.

158. The principal of the Mayo School is a distinguished artist. His staff includes hereditary, as well as trained craftsmen, but we understand that some of them have not had that good general education which is desirable for a teacher whose classes may include students whose education has been prolonged. The probable reason for this is that it has not been customary n the past for well-educated men to take up the practice of a craft.

We were glad to have the opportunity of seeing this school at work on two occasions.

159. The Government School of Arts and Crafts, Lucknow, teaches the following branches—fine art, drawing for reproduction, architectural design, art-printing (Litho and Process); goldsmith's work; silversmith's work; woodwork; iron work.

In addition to the instruction in these courses, which normally cover five years, there are special short courses for artisans who wish to improve their technique. The instruction in these includes:—Clay modelling; enamelling and engraving; metal casting; sculpture; wood carving; art-printing.

In January, 1937, there were 226 students following the ordinary courses; 15 undergoing a two years' course training for work as teachers; and 31 in attendance at the short courses for artisans. The number of students was thus 272 in all.

160. Like the principal of the Mayo School of Arts and Crafts, the principal of this school is an artist of high repute, while the members of his staff appear to have the same kind of qualifications as the craft teachers at the Mayo School of Arts and Crafts.

It was of interest to learn that, so far as could be ascertained, about 70 per cent. of the students of the school obtain employment immediately after the completion of their course.

161. While we were very favourably impressed by the quality of the work done in both these Schools of Art, we think that their spheres of influence could with advantage be enlarged considerably. In the first place, each of them is the obvious centre for the training of men who will be responsible for the teaching of art in the Middle and High Schools of their Provinces. There is, as we have said, a serious lack of instruction in this subject in these schools, and, until this defect is made good, the Schools of Arts and Crafts themselves will suffer from a dearth of well-educated students who, after a broad education in art, will give new life and inspiration in their several Provinces to that tradition of craftsmanship which appears likely to decay. It is true that there are at present fifteen students at Lucknow who are being trained as teachers; but this number is inadequate for the needs of a Province with a population of about fifty millions. The state of affairs in the Punjab is even less satisfactory, since there are at present no students undergoing this training.

In the second place, an effort should be made to improve the artistic side of the industries of India, and the Schools of Arts and Crafts are the obvious instruments for effecting this improvement. We are aware of the steps which have already been taken by the Department of Industries in the Punjab to improve the design of the cloth made on the hand-looms in that Province, and of the corresponding steps taken with the same end in view in the United Provinces; and the work done at both Amritsar and Benares appeared to us to be excellent and adapted for the purpose. We are, however, of opinion that, taking a long view, the tasks of both these Departments would be made easier if the design of cotton goods were brought into closer relationship with the Schools of Arts and Crafts in both Provinces. There is little doubt that those responsible for design in one material would be helped to retain their freshness and originality by working in association with others designing in other

materials. We hope therefore that it will be found possible to institute at both the Schools of Art courses of instruction in textile design of a really practical character. Some addition to the equipment of the schools would be necesary, but this would not be very costly, as excellent work could be done on suitable hand-looms.

162. The dearth of facilities for the study of art in both Provinces is a matter which appears to us to demand the most serious attention, since the existing schools are not within convenient reach of other large centres of population. It is true that the artistic side of production is not lost sight of in the Industrial Schools which are concerned with textile and woodworking, for example ; but we think that it would be of advantage to establish art schools—working in close contact with the existing Schools of Arts and Crafts, which are the major institutions—in other important centres of the Punjab and the United Provinces. The existence of the hosiery industry at Ludhiana and of the woodworking industry at Bareilly suggest that these two centres might be selected for the purpose of establishing such schools as experiments. If the experiments proved successful, other schools might be set up as opportunity served or the needs demanded, until there was a really effective system of art education in this part of Northern India, bringing benefit to its industries and thus to the population generally.

### *Museums.*

163. We understand that it is customary for many visitors from rural districts to use the opportunity of being in Lahore to see the collections in the Museum there, and, although we did not inquire as to this at Lucknow, this may be true about this Museum also. In view of the opportunities for the study of Indian art that these collections afford, and the interest already taken in them, we suggest that far greater use should be made of them than at present. This could be made possible by the gradual building up in each Province of a "Loan Collection" from which good examples could be lent to the Industrial and Technical Schools in the two Provinces. Colour photographs of textiles, of carpets, and of enamel or lacquer work could be included in the loan collection, and would undoubtedly serve the purpose of giving fresh ideas to craftsmen in places at a distance from the Museums themselves. We do not suggest that this should be started on any large scale, but only that a beginning should be made with the view of extending the scheme as was found practicable. We make this recommendation, as we have seen elsewhere the value of this method of extending the influence of Museums.

## CHAPTER X.

### PART-TIME SCHOOLS.

164. The schools we have described earlier are intended for pupils who have decided upon the careers they will follow, but have not yet entered employment. The provision of schools of this type is not, however, sufficent for the requirements of a manufacturing and trading community, since it assumes that when the formal education is completed, experience in the workshop or the office will give all the further training needed. This is not the case as regards

either apprentices to skilled crafts, or young men ambitious of promotion within the grade in which they start work or possibly to a higer grade. A skilled craftsman is all the better for understanding the principles underlying practice, while a young man aiming at promotion must necessarily gain further knowledge if he is to achieve his ambitions.

165. Every great industrial country organises a system of part-time education for its employed workers. This may be provided in—

(*a*) Evening technical or commercial schools.

(*b*) Day technical or commercial schools.

In the former case the youth gives up his own time to attendance at school after the end of his day's work ; in the latter case, he can only attend if he is released from work for the purpose.

In Great Britain, the great bulk of the part-time attendance is in the evening, though the number of employers who are willing to allow " time off " during the day is slowly increasing, In Czechoslovakia, the whole of the part-time instruction is provided before the hour of 6 P.M., and employers are under a legal obligation to permit of the attendance of their apprentices at school for not less than eight hours a week during at lest two years, although it may be as many as four years. Whether instruction given during the day-time should be for a certain number of hours each week, or for continuous periods of some weeks or months, depends on the circumstances of the industry and of the school.

166. The Maclagan Engineering College at Lahore has now arranged that the most advanced students shall spend in the engineering workshops two out of the three vacations which occur during their course. The same plan is adopted at this college for the second group of students, who attend for five years and must, in order to qualify for the college certificate devote three months in each year to practical work in the shops.

This plan of alternating school and work in periods of months is undoubtedly of great value. It is known in Great Britain, where it has been adopted in a number of centres, as the " Sandwich system "

167. Although we have found instances in India of young workmen being allowed to absent themselves from work on Saturday mornings in order to attend school, we do not think that the practice is as frequent as is desirable. Experience elsewhere shews that very great benefit is derived from concurrent workshop experience and theoretical instruction. It has been found, for example, that a diligent student can, in three years of evening attendance at a technical school, reach the standard, in the subjects he studies, of the Intermediate examination for the pass degree in Engineering ; and that, in another two years, he can reach the standard in the subjects studied of the final pass examination for the degree. In order to do this, he must attend regularly for a total of about eight hours a week during rather more than half the year and, in addition, devote most of what spare time is left to him to private study and home work. Naturally, if he is set free to attend school during the day-time for one or two half-days a week, his task is far easier.

It is only the more able and persistent students who make great progress by evening attendance only, as the demands made on their physical energies

are considerable. For this reason, we hope that when part-time education in India is further developed, it will be mainly day-time instruction made possible through the co-operation of industry.

168. A number of questions arise when it is proposed to allow " time off " to students already in employment. For example, ought the concession to be made to all apprentices irrespective of their merits, or only to those who have shewn that they are worthy of it ? What should be the amount of the release ? Should it take the form of hours per week or of weeks per year ? Should wages be paid for the time of attendance at school ? Should students released for one or two half-days a week be expected to give up some of their own time to evening attendance ?

We are of opinion, that, in general, only those students should be granted the privilege who have shewn by their industry and ability in ordinary every-day tasks that they are worthy of assistance of this kind ; that the time allowed to them should normally be two half-days a week ; that it is fair to ask them to give up from their own time one evening a week, at any rate, to school attendence ; and that the continuance of the privilege should always be conditional on their earning satisfactory reports both from the foreman who knows their daily work and from their teachers. As regards the payment of wages, we understand that it is usual for English employers to pay these for the time lost from work.

169. We have been interested to see that the Royal Commission on Labour in India, reporting in 1931, recommended that a few selected operatives in some industries should be provided with a " simple form of education " in working hours, as they considered that this would go far to solve the difficulty of obtaining suitable men for the lower supervisory grades.

The commission had in mind the training of a rather lower grade of worker than we are discussing here, as they stress the need for general rather than technical education ; but, from the present point of view, it is of interest to note that they recommended that at least three afternoons a week should be devoted to education, and that promising men should be given time off with pay. Incidentally, they went farther than we do by suggesting that it might be necessary for employers to assist in providing the education.

*Curricula of Part-time Schools.*

170. In drawing up curricula and syllabuses for part-time schools, it should be remembered that the students are already spending most of their time in practical work. What they need, as a rule, is not more work of this kind, but explanations of the " why " and " wherefore " of the operations they are engaged in, or see going on around them. The part-time school will usually devote its attention almost wholly, so far as industry is concerned, to teaching mathematics and those branches of science on which the practice of industry is based. At the same time, it may be necessary in some instances to provide classes in practical subjects, when a method of working, new to a district, is being introduced into the local works. It would be reasonable, for example, to provide part-time classes in electric or acetylene welding in an area where these had not been practised previously. In such instances, however, attention should always be paid to explaining the theoretical side of the operation.

Examples of curricula and syllabuses which have been found suitable for use in part-time schools by pupils already in employment are given in Appendix IV.

*Evening Attendance at Part-time Schools.*

171. Although we have urged the provision of part-time education during the day rather than the evening, there are circumstances in which evening attendance is appropriate. There are in the greater towns of India large numbers of men working at crafts on their own account, who might find difficulty in giving up much of their working time to attendance at classes. Amongst these are the men engaged in artistic crafts, and we see no reason why special evening classes should not be organised for them within the Schools of Art, where they would not only learn the best methods of manipulation, but would also have the opportunity of improving their knowledge of design.

*Premises of Part-time Schools: Staffing.*

172. We do not contemplate that "part-time" schools should be carried on in buildings of their own, but that they should, as in Europe, be held in the same premises and make use of the same equipment as the "full-time" schools. We are aware that difficulties occasionally arise when two sets of students have to use, at different times, the same laboratories and drawing offices. It would, however, be wasteful to duplicate these, and the difficulties can usually be readily overcome by having one principal for both institutions, especially if he is endowed with tact.

173. The staff for full-time work can often be supplemented with advantage by specialists from outside, who may not be professional teachers, but are willing to teach for a few hours a week. It is true that these men are often less skilful as teachers than their professional colleagues, but what they lack in skill is made up by the realistic atmosphere they bring into the classroom.

## CHAPTER XI.

### Recruitment for employment in certain Industries.

174. Although we have confined ourselves in the main to describing a frame-work for vocational education, since no special surveys of the requirements of industry and commerce have been made, we are able to make some suggestions with regard to the recruitment and training of young men for several important branches of industry, whose circumstances could be learned without such a survey.

First among these is the railway service, which is able to prescribe the qualifications and the kind of training needed by the large numbers of youths entering it, even though its field of recruitment covers a very wide area; exactly the same applies to the Public Works Department; and we have had the opportunity of consulting officers of the railway service, and of seeing the prospectuses descriptive of the method of recruiting future officials of the Public Works Department.

As regards the printing industry, so much of it is concentrated at Allahabad, that information as to its present means of recruting and training was conveniently obtained.

*The Railway Service.*

175. According to the Report of the Royal Commission on Labour in India, the total mileage of the Indian Railways is in excess of that in any other country save the United States of America. With a total staff of over 800,000, the railway administrations are the largest employees of organised labour in India. At the present time, 72 per cent. of the total mileage is owned, and 45 per cent. is directly managed, by the State, through the Railway Board constituted in 1905 and re-organised in 1922. "This Board is directly responsible to the Government of India for the State-owned railways managed by the State, and has complete administrative authority over the general managers or agents of these railways, to whom considerable powers have been delegated. Within the grants at their disposal, the agents are competent to create most of the higher subordinate and all the lower posts and to grant additional pay to individuals; they have also full control over the non-pensionable subordinate establishment in matters of appointment, promotions, etc." It is clear from the immense size of the railway undertakings, as described in the Report of the Royal Commission, that their policy as regards working conditions is bound to react to some extent on the conditions in other branches of industry: and this furnishes an excellent reason for planning carefully the conditions of recruitment in this industry.

In our inquiry, we are concerned with only the method of recruiting and training the members of the employed staff; and in regard to this we received information from the responsible members of the staffs at Lahore and Lucknow, to whom we wish to express our thanks for the pains they took to provide it.

*The Meohanioal Engineering Departments.*

176. The North Western Railway, which has a mileage of 7,000 and employs over 100,000 persons, has large engineering workshops at Lahore. It recruits for positions below the highest grade, three classes of youths :—

(*a*) Apprentices to engineering, whose entrance qualification is the possession of a matriculation certificate. These serve a five-year course, working in the shops for nine months in the year and spending the other three months at the Maclagan College of Engineering. When they complete their terms of apprenticeship, they become, first, improvers and then journeymen, after which they may be promoted to the grade of chargehand and finally to that of foreman.

(*b*) Trade apprentices, who after finishing their apprenticeship, become improvers and are afterwards graded as skilled artisans; some of them may become later on "mistris" or junior chargehands.

(*o*) Coolies, who are either unskilled or semi-skilled workers.

We understand that there is no transfer from one grade to another.

177. The conditions of admission to trade apprenticeship were of particular interest to us, as they prescribe that a boy shall have reached Class VI of the Middle School and shall be between the ages of 15 and 18. In our opinion, this scheme has the defect that a really intelligent boy ought to have reached Class VI by the age of about 13, but, being still too young for admission to employment in the railway engineering shops would have to spend two years or so waiting for this. Accordingly, it seems unlikely that the service will secure the best type of recruits, in spite of the prospects it holds out to boys of ability.

178. From the inquiries we made of an official of the East Indian Railway at Lucknow, we learned that the conditions of entrance for trade apprentices on this system are very like those existing at Lahore, the limits of age (15—18) being the same, though the exact standard reached in the school attended is not definitely laid down.

179. We suggest that the authorities of the railways shall consider the advisability of modifying the conditions of recruitment for both ordinary and trade apprentices, if indeed they do not abolish ultimately the distinction now existing between the two classes.

This could be done by arranging with the Provincial Governments concerned for the setting up of Junior Technical Schools in each important railway centre which possesses workshops of sufficient size, and by the Railway Board, through their agents, prescribing that entrance to employment in these shops shall be open, not only to boys holding a matriculation certificate, but also to those who have passed with credit through these schools. We know of no more effective preparation, either for skilled craftsmen or for foremen and charge-hands, than that afforded by schools of this type. Necessarily, the change we suggest could not be carried out quickly, as time would be needed for the schools to be established and for them to find their footing. In the meantime, the important step of raising the standard of admission to trade apprenticeship from Class VI to Class VIII could be taken, not only for the sake of improving the qualifications of the recruits to skilled work, but in order to indicate to parents and others that changes of importance in the mode of recruitment were impending.

*Other Departments of Railway Service.*

180. The North Western Railway possesses at Lahore an extremely well-equipped institution—the Walton Training School—for training candidates for employment in (*a*) commerce and transportation, and (*b*) work concerned with the permanent-way, with signals and interlocking, and with bridges. In addition to these, it conducts short "refresher" courses for persons already in the service of the railway.

The qualification for admission to the courses for recruits is, in general, the matriculation examination of an Indian university, though the Junior Cambridge Local examination will be accepted for this purpose as its equivalent. In some cases, *e.g.*, candidates for employment as guards, it is much higher, Class I, Grade I guards being expected to have passed Intermediate Science or Arts, while Class I, Grade II guards must have passed B.A. or B.Sc.

Candidates for employment in the commercial and transport section must be between 18 and 21 years of age on admission, with the exception that boy-firemen will be admitted between the ages of 16 and 21, while guards must be between 18 and 24, or between 18 and 30, according to the grade they wish to enter.

Candidates for employment in the permanent-way, signal and interlocking and bridge sections must be between 17 and 21 years of age.

181. After visiting the Walton School, with whose work we were greatly impressed, and after discussion with its principal, we have reached the conclusion that entrance to those courses of training which admit boys of 16 or 17 and include an engineering element should be open to boys who have passed with credit through a Junior Technical School and that entrance to those courses of training for boys admitted at the age of 18, which possess a commercial element, should similarly be open to boys who have satisfactorily completed the course of a Senior Commercial School.

182. We have dealt at some length with the method of recruitment to the railway service, and made suggestions for its modification for two reasons. In the first place, we believe that the Junior and Senior Vocational Schools, when once they had settled down to their task, would supply annually a more suitable type of recruit than is possible under the existing conditions.

In the second place, a fairly constant demand by the railway service for boys educated in these schools would do much to make it really worth while for the Government Departments concerned to establish vocational schools in the important railway centres, as they would be sure of having a nucleus of pupils in them who were candidates for employment in the railway service. We are confident that as the schools became better known, they would be appreciated by persons in other industries, since the great need of organised industry in India, as in other countries, is that for skilled craftsmen and competent foremen: and there is, as yet, no organised method of recruiting and training them which is comparable with the methods employed in European countries.

*The Publio Works Department.*

183. As we had not the opportunity of visiting the Thomason College of Civil Engineering at Roorkee (United Provinces) or the Government School of Engineering at Rasul (Punjab), we inquired as to the conditions of entrance to these institutions. We learned that for the " Overseer " class at Roorkee, candidates must be between the ages of 16 and 21, and must, before being admitted to the competitive examination for entrance, have passed the matriculation examination of the Allahabad university or an equivalent examination.

The entrance examination requires a knowledge of English and the vernacular, arithmetic, algebra, geometry, drawing and Hindustani.

184. The conditions of entrance to the " Overseer and Draftsman classes " of the School of Engineering at Rasul are very similar, but the age limits are 17 and 21.

We suggest that, as in the case of the railway service, arrangements shall be made, as soon as this becomes feasible, for candidates for admission to either of these institutions to offer a certificate indicating the satisfactory completion of the Junior Technical School course, as equivalent for this purpose to a matriculation certificate. This change would not affect the present requirements except by the addition of a fresh type or preliminary education to those already recognised.

*The Printing Industry.*

185. The printing industry is highly localised in the United Provinces, there being several large private presses and an important Government press at Allahabad. We had the opportunity of visiting two of these, as well as the printing school carried on by the Church Missionary Society at Sikandra which is, so far as we could learn, the only institution in the Province which provides instruction in typography, although litho draughtsmen have been trained at the Thomason School of Engineering, and there is a class for lithography and process-block making at the School of Arts and Crafts at Lucknow. We are of opinion that there is ample scope for the establishment of a school of printing at Allahabad, especially as it has been found desirable in the past for Indians to go to England to follow the courses at the London School of Printing in order to receive their training.

186. At the present time, there is no definite method of recruitment to the various branches of the printing industry in the United Provinces. Compositors usually begin as type distributors, and, although the bulk of the work is in English, it is rare for them to have any great knowledge of that language. Linotype and monotype keyboard operators are usually recruited from the more intelligent compositors, but it has been found that clerks who have had experience of the typewriter, supplemented by some training as compositors, make suitable operators. The machinemen engaged as letterpress and lithographic printers have often entered the industry as labourers and machine assistants, while the bookbinders have started as folders, paste boys or as workers in other routine tasks. The supervisors have usually been selected from amongst those workmen who shew capacity for control, have a reasonably sound knowledge of the process, and possess sufficient knowledge of English to enable them to follow intelligently the instructions on the work dockets.

187. In considering the grade and type of technical school to be established, it is necessary to take into account the circumstance that the letterpress printer must have an adequate knowledge of English; if it were not for this requirement, we should recommend that the school should be of the Junior Technical School type. As it is, we see no alternative to its being of the Senior type, which admits boys from the High Schools who have learned English.

188. There is another important factor. Since the training is narrowly vocational, a pupil entering the course must have something like an assured prospect of employment when he has completed the course. In London, this is made certain by the boy being indentured as an apprentice to a firm before he is admitted as a "trainee" to the London School of Printing. We understand that there is no system of apprenticeship in the printing

industry in India, but we think that every firm in the area should undertake to give employment to a specified number of boys who complete the course satisfactorily.

*The Printing School.*

189. The course in the printing school should normally occupy not less than three years, during the first of which general education, including art, should occupy half the available time, though this proportion might be diminished during the later years.

Instruction should ultimately be planned to meet the needs of :—

(*a*) Hand compositors.

(*b*) Machine compositors.

(*c*) Letterpress machine workers.

(*d*) Lithographic printers.

(*e*) Process engravers.

At the start, it would probably be sufficient to provide instruction for the first three of these, leaving lithography and process engraving to be added when the school was firmly established.

In the first year of the course, every pupil who is to be engaged in typography should be taught hand composing, even though he will never be called upon to do this in his ordinary work, since it is of great importance that he should have a good knowledge of lay-out, and this is best obtained by hand work. It is indeed a general rule in every industry that a machine worker will benefit by learning to do by hand what the machine does more exactly and more expeditiously, and the printing industry is no exception to this.

190. The school should possess one or two well chosen faces of type of good design in a wide range of sizes, and several small founts of good type in a few sizes only for comparative purposes. It should be equipped with at least one composing machine, as well as a number of dummy keyboards, and should possess hand presses. It is of importance, however, that the students should learn to work under commercial conditions with modern equipment, and accordingly it is suggested that during the two later years of the course, arrangements should be made for them to work for three or more half-days in the week, or even as much as half their time in the printing works in which they will be employed on the completion of their course. We realise that this involves the firms concerned in some re-organisation of certain portions of their works, but we have little doubt that they will be willing to go to some trouble to secure the better training of their staffs.

191. It is not usually practicable in a works to grade very carefully the instruction in the ordinary operations, and for this reason the practical work in the early stages of the teaching of composition should consist of exercises in plain setting, with special reference to spacing and justification, proofing, correcting and distributing ; these should be followed by exercises in a large variety of jobbing work, including commercial and advertisement work and intricate tabular work. In the third year of the course, pupils should be given some knowledge of costing and estimating.

# CHAPTER XII.

## The Training of Vocational Teachers.

192. Since India has so little experience of vocational education, special arrangements for the training of the teachers to be engaged in this branch of education are necessary. The present training colleges have throughout their existence devoted their attention to fitting young men for work in schools which provide either general education only, or education with a bias towards rural pursuits. The teachers in vocational schools must, however, have a different outlook; their pupils have narrowed their educational aims by defining them and the teaching must have full regard to this cardinal fact. We do not suggest that the teachers should limit their own outlook. On the contrary, they must continue to take the widest possible view of their responsibilities, since they are to guide their pupils to equip themselves for life as well as for livelihood; but this view must also be a long one, stretching beyond the school and including more than a glimpse into the world of industry and commerce.

193. A vocational teacher must have pedagogic knowledge and skill; he ought to be able to interpret a syllabus laid down for him, even if he has not the gift of being able to draw up a good syllabus for himself; he must be able to handle a class and to interest his pupils; and he must be familiar with the ordinary routine of a school. It is precisely this kind of equipment for his task that a training college can give him. Accordingly we are of opinion that the existing training colleges can be used with advantage for the earlier part of the training of vocational teachers.

194. This equipment is, however, not enough for a man who has to prepare pupils for industrial or commercial life. He must have a thorough knowledge of the subjects which he proposes to teach, and of the best way of presenting them to his pupils, remembering always that the connection between theory and practice must be maintained by the choice of examples and illustrations from industrial or commercial practice. For example, the teaching of mathematics should include calculations which arise in actual works practice; and in the teaching of the principles of geometrical projection, simple machine details, or examples of simple structures of wood, should be used as models, while the value of the ability to make a dimensioned hand-sketch of a machine detail should not be forgotten.

195. The vocational teacher should also have had opportunities of visiting works, preferably in a small party rather than as a member of a crowd, and should have read books, as well as attended lectures, descriptive of the general organisation of the industries into which his pupils will enter.

196. The course in the ordinary training college must therefore be supplemented by some other institutions which devotes special attention to this essential element in the training of a vocational teacher and gives him the necesary outlook and knowledge. This institution should work in close connection with the training college from which its students come.

*The Vocational Training College.*

198. The vocational training college—if we may so term it—should be accommodated in the same premises as a technical school, which would serve as a practising school for it. The demand for vocationally trained teachers will for some time be small, and it is probable that a single institution of the kind we have in mind would meet for a number of years the needs of the three Provinces of Delhi, the Punjab and the United Provinces.

199. We suggest therefore that the Government of India should establish such an institution at Delhi, and should invite the Government of each of the two neighbouring Provinces to entrust to one of their ordinary training colleges the task of co-operating with it. Admission to the vocational training college should be confined to men who had already received a general training in pedagogy at the associated provincial training college and had shewn their fitness for vocational teaching. In the first instance, not more than ten or twelve such men should be selected, although this number might be increased if later experience proved that this was desirable.

200. Teachers in training would be instructed in the methods of teaching science and technology ; they would act as assistants to the regular members of the staff of the technical school, serving as demonstrators in the laboratories and workshops, and sometimes themselves taking classes under the supervision of either the principal of the whole institution or of a senior member of his staff.

It is estimated that a six months course would suffice for this part of the training.

*The teachers in training.*

201. The teachers selected for vocational training should, as a rule, possess degrees in science, and a start should be made with those who have had a course of engineering training, since they would have had some workshop experience and would be acquainted with most of the fundamental subjects taught in the technical school. All of them should be chosen after an interview, as it is important that they should have the right kind of interests and outlook, and this is best ascertained by oral discussion with them.

202. Some of the teachers of "technological subjects" such as textiles, would necessarily have very different qualifications. It would not be practicable to arrange for these to spend any time at the ordinary training college, but a six months course at the vocational training college would undoubtedly increase their fitness for their work.

*The Technical School.*

203. A pressing need in Delhi, which has not yet had a technical school of any kind, is for an efficient Junior Technical School of the type described in Chapter VI. We recommend that the establishment of this should be the first step taken. As soon as it has become a stable institution, it would be possible to extend its activities by the provision of facilities for the teaching of art and the training of craftsmen. It should also serve the needs of persons already in employment by conducting a variety of part-time classes, and would thus constitute what is often known as a "polytechnic" institution.

Such a school, if it is to serve its purpose fully, should develop a strong corporate life through the setting up of clubs and societies amongst its students; but this development should not be forced or imposed from without.

It is this institution with which the Vocational Training College should be associated.

*Staffing.*

204. The principal of the institution should be responsible for the organisation and supervision of the whole of the work carried on within it. In view of the need for entrusting it to a man with wide experience of vocational education, we recommend that the first principal shall be an engineer, who possesses a good degree, has had sound workshop training and has gained experience in a large English technical school which carries on both a Junior Technical School and part-time classes. His engagement should be for a minimum period of five years, since he must have time, first, to plan the work of the institution to suit Indian conditions, and, second, to see at least one generation of pupils complete the course of instruction of the Junior Technical School.

205. The members of the staff responsible for the teaching of science, mathematics, technical drawing and workshop practice should have been trained at such institutions as the Maclagan Engineering College at Lahore, the Engineering Department of the Hindu University of Benares or in the case of the teacher of woodwork, at either the Central Woodworking Institute at Bareilly or the Government Woodworking School at Allahabad.

It is important that the teacher of English should have a good colloquial acquaintance with the language, but he need not necessarily have studied the niceties of the style of English authors.

*The Junior Technical School.*

206. During the first two years of its course, the Junior Technical School would follow the general lines laid down for schools of this type in Chapter VI. In the first year, however, the practical workshop instruction would be in woodwork, while in the second year the exercises would be in metal work.

207. Boys attending for the third year would be divided into three groups in accordance with the requirements of their future occupation. The branches of instruction would be :—

(*a*) *General Engineering Practice*—

The aim of this course would be train mistris for garage work, fitters for textile factories, and other skilled craftsmen employed in the ordinary maintenance and repair of machinery.

(*b*) *Electric Wiring*—

This branch is one of increasing importance, since the use of electricity for industrial and domestic purposes is developing rapidly in the Provinces we have visited.

(c) *Cotton Spinning and Cotton Weaving*—

The aim of this course in the Junior Technical School should be to train jobbers, overlookers and others with similar responsibilities.

208. Although it is suggested that, in the first instance, these specialised courses, superimposed on the more general vocational course given in the first two years of the Junior Technical School, should occupy only one year, it might be found necessary in the future to extend them to two years. This extension should not be made without very full consideration of the circumstances, since it is necessary, in the interests of the pupils, that they shall not delay unduly their entrance to employment. In most instances, they would derive greater benefit, we believe, by continuing their education in part-time classes than by prolonging their full-time education.

### *Admission to the Junior Technical School.*

209. The Junior Technical School should admit annually not more than 20 pupils, who have passed the First Public examination at the end of Class VIII and have not yet attained the age of $15\frac{1}{2}$. This age limit should, however, be lowered to $14\frac{1}{2}$, or possibly even 14, as the efficiency of the educational system increases.

### *Accommodation and Equipment.*

210. We have visited the premises of the Government High School in Delhi, which seems to us suitable for the joint use of a Technical School and Vocational Training College, if the necessary alterations and additions to its accommodation are made. It is conveniently situated and possesses 20 classrooms, 3 of which have an area of more than 1,100 sq. ft., good playing fields, a small hostel, a swimming bath and ample space for any additions that may be required. There is on the same site a Commercial School, which ought to be regarded as part of the complete institution.

Substantial new accommodation and equipment would be needed if, as is desirable, the teaching of textiles were to be undertaken. We have however, reason to believe that any good scheme for instruction in this subject would be considered very sympathetically by leaders of the local textile industry.

## CHAPTER XIII.

### VOCATIONAL GUIDANCE AND SELECTION.

211. The choice of the career which he shall follow is one of the most momentous decisions made by every young man, and it is of importance that he shall have all the help possible when the time comes for making it. As we know, it is very frequently made without any proper regard being paid to the likes, dislikes, aptitudes and inclinations of the individual, and with little consideration of the prospects which the career can hold out to him. Chance and local circumstances are the deciding factors in too many instances, with the inevitable result that, in every country, there are multitudes of " misfits "

in both industry and commerce, doing work uncongenial to them and very often therefore doing it rather badly.

In view of facts like this, a great deal of attention has been paid, both in European countries and in the United States of America, to what are known as " vocational guidance " and " vocational selection " The establishment of organisations for the systematic employment of methods of ensuring that young persons shall enter occupations for which they are best fitted is of somewhat more recent growth in Australia, South Africa, Japan, and two or three great cities in China, but in these countries also steps have been taken with this end in view.

212. It is obvious that the guidance of a boy or girl into an occupation for which he is suitable depends on—

(*a*) an ascertainment of both the personal qualities and the knowledge needed for efficient work in each occupation which is available to the members of the group of young persons for whom vocational guidance is desired,

(*b*) an ascertainment of the qualities, that is, the interests, aptitudes, inclinations and abilities of the individuals constituting the group,

(*c*) machinery for relating the qualities of each individual to the qualities needed for success in the occuptaion.

It is all the more important that a youth shall receive vocational guidance when it is proposed that he shall devote some years of his life to attendance at a vocational school before he actually enters employment, since the teacher in the school may be far more reluctant to tell him that he has chosen the wrong career than an employer will be, when he finds that he is called upon to pay wages to a youth who is neither competent, nor likely to become competent, at his task.

213. Although progress has been made in many countries in the direction of determining vocational suitability, we are not convinced that the investigations have yet reached the point at which their results are of general applicability they can, however, be applied with confidence over a limited portion of the field. In France, where the study of vocational guidance has been pursued with great energy, it is usual for the trade schools to rely partly on tests of vocational aptitude, and partly on the test of practical experience in the workshop. When a boy enters one of the trade schools carried on in Paris, he is set to work in a particular branch for some weeks, and his progress is carefully watched. If he is found unfitted for it, he is transferred to another branch. This method of supplementing initial tests of suitability by the results of actual experience appears to us, in the present state of knowledge, to be a sound plan, and one which might be followed with advantage in the vocational schools of India.

214. Vocational selection differs from vocational guidance, since it is concerned with the choice of the most suitable candidate amongst a number of persons presenting themselves for employment in a particular kind of work. A number of great undertakings, such, for example, as those engaged in transport, have organised methods of testing candidates for posts as motor-drivers

or engine-drivers. A motor-driver ought to have good eye-sight, an ability to estimate speeds and distances, rapid reaction to external visual stimuli, and the habit of concentrating his attention without fatigue on his task. Although these characteristics are such as can easily be ascertained, it is not so easy to determine what are the exact characteristics to be looked for in an administrator, who carries high responsibility for maintaining personal relationships with others, and at the same time, has to deal with important impersonal matters. There is no doubt, however, that the results of the work now being done by skilled investigators through the world will ultimately result in the development of effective methods, applicable over a very wide field, of both vocational guidance and vocational selection.

In the meantime, it should be remembered that the number of trained men, accustomed to the investigation of vocational aptitude, is not great in any country. This is no reason why a study of the subject should not be started in India, either by men trained in other countries, or by Indians who have been given the opportunity of investigating the methods in use overseas.

215. We have noted with interest the statement presented by Dr. Charles Myers, Principal of the National Institute of Industrial Psychology in London to the Committee on Unemployment in the United Provinces presided over by the Right Hon'ble Sir Tej Bahadur Sapru. Dr. Myers says "The Institute considers that an attempt may well be made to formulate a scheme where by its procedure may be adapted to Indian needs. It suggests that experienced members of its staff should be charged with the duty of preparing, in consultation with the Indian authorities concerned, a scheme for the training of both men and women in the Institute's technique. This scheme could be carried into effect either in India or in England. The scheme would cover—

(1) training in the selection of children for secondary education;

(2) training in the selection of adolescents for university education;

(3) training in the vocational guidance of undergraduates and graduates

The persons selected to receive such training should be of a high degree of intelligence, they should be capable of establishing easily and quickly a friendly relationship with those they are called upon to advise, they should be patient, and they should have wide sympathies and be free from extreme views. They should also be capable of instructing others, both by group and individual teaching methods, in their technique, but their interests, should not be predominently academic."

216. In our view, this statement summarises fully and with clarity the qualifications of those persons who may undertake the task of advancing in India the knowledge of the methods of vocational guidance and selection, and of applying this knowledge to useful ends. The problem is, however, too complex to be attacked successfully by any one Province, and if, as we hope, an attempt is made to contribute to its solution in India, it seems desirable that a number of the Provinces of India should co-operate together for the purpose.

*Advice on Careers.*

217. The Unemployment Committee of the United Provinces recommended that the Government should undertake the publication of a series of pamphlets describing careers for boys, as is done by the Ministry of Labour in England. The pamphlets describe the preliminary education needed for each career, the method of entering upon it, the prospects and the means of obtaining further education relating to it. They serve an extremely useful purpose in England and we endorse the recommendation of the Unemployment Committee fully.

## CHAPTER XIV.

### Summary and Recommendations.

*Chapter I.*

1. Large-scale industries require an adequate supply of men specially trained for the responsible posts in them. It cannot be expected, however, that men will undergo training for work in these industries unless they see a reasonable prospect of suitable employment. The expansion of vocational education should therefore not greatly outstrip the development of industry. (Sections 2-3.)

2. If, however, vocational education is not too specialised and if it aims at cultivating flexibility of mind and certain personal qualities which are as much moral as intellectual, industry and commerce should be able to absorb a somewhat larger proportion of trained men than an exact computation of their existing needs would appear to justify. (Section 4.)

3. Every province should make a survey of the educational needs of its industries and commerce and thus determine the types of vocational education to be provided, the stage to which each type should be carried, and especially the number of recruits that can be absorbed annually. Until such a survey has been made, it is impossible to do more than prepare an educational framework into which vocational Schools and courses of instruction can be fitted. (Section 5.)

*Chapter II.*

4. Vocational education is not on a lower plane than literary education, since the full purpose of education is to develop the whole powers of the mind, body and spirit so that they may be devoted to the welfare of the soceity. (Section 6.)

5. No country can develop its trade and industry through the work of second rate men only. The conditions in India, as in other industrial countries, demand that business shall have its fair share of the best brains available in the country. (Section 7.)

6. General and vocational education are not essentially different branches, but the earlier and later phases of a continuous process. Each subject in the vocational school has its origin in the non-vocational school. (Sections 8-9.)

7. General and vocational education should not, however, be provided in the same school, since the pupils in the two types have very diverse aims. Education for industry can, with certain safeguards, be given in the same school as education for commerce. (Sections 10-11.)

8. Vocational education is not a matter for the school alone, since it is a specific, and not a general, preparation for employment. Industry and commerce must co-operate with educational organisations if the vocational education provided is to be appropriate and adequate. Organised co-operation of this kind does not yet exist in India. (Sections 12-13.)

9. There appears to be a common belief in India that a more adequate supply of vocational education would lead quickly to greater use being made by organised industry of the raw materials of the country. The existence of skilled workers, though essential, is not in itself enough to create organised industries. Capital, means of transport and reasonably assured markets are also needed. Although a certain degree of caution in the plans for training men for organised industry is therefore necessary, schemes for improving the skill and efficiency of cultivators and small-scale workers can be safely undertaken. (Sections. 14-15.)

*Chapter III.*

10. The problem of improving the lot of the villager is formidable. The population consists mainly of small holders the villages are generally isolated from one another and from towns the cultivators are mostly illiterate and they are reluctant to abandon old customs and to adopt new methods. (Section 16.)

11. There is little possibility of a cultivator becoming a successful small-scale worker, though the village artisan might be trained to repair and refit agricultural implements. (Section 17.)

12. The small-scale workers may be divided into (*a*) those who compete with organised industry (*b*) those who carry on hand-crafts even when employed in organised industry. The former need better appliances and the ability to use them ; the latter are dependent mainly on their personal skill. Both classes need better training than is yet available. (Section 18.)

13. Manufacture on the small scale is very prevalent in India. Even if organised industry expands greatly in India, there will still be room for the small-scale manufacture of (*a*) goods needed in small quantities, (*b*) goods which demand an individuality of their own. If the progress of organised industry is not to displace the small-scale worker, he must have the opportunity of adapting himself to changing conditions ; and immediate steps to this end are necessary. Greater attention must be paid to his training, and especially to his training in art where this is appropriate. (Sections 19-20.)

14. Organised industries can be divided into (*a*) "manipulative ", *i.e.*, those in which large practical experience is needed by the supervisor, and (*b*) " non-manipulative " in which, on account of the simplicity of the plant or of the process, the necessary knowledge can be acquired more quickly. (Section 21.)

15. The size of each industrial unit of organised industry in India is usually far larger than it is in Western countries. (Section 22.)

16. In general there are three grades of workers in organised industry (*a*) the directing and managing grade, (*b*) the supervisory grade, and (*c*) the operative grade. The proportion of persons of the directing and managing grade in India is smaller than in Western countries, and many of them have been educated outside India. There is no great demand for an immediate and considerable increase in the facilities for the vocational education of the members of this group, but the matter should be kept under continual review. The existing institutions providing vocational education of an advanced grade are doing excellent work, and are capable of rapid expansion when the need arises. (Sections 23, 24.)

17. It is the supervisory grade, *i.e.*, foremen, chargehands and similar workers, on whose education and training great attention should be concentrated at this stage in the development of organised industry in India, since they hold the key to efficiency in production. (Section 25.)

18. Full-time vocational schools can do little for training the operative grade of workers, except those engaged in the maintenance of the mechanical plant. (Section 26).

19. It is important that in any scheme of vocational training for industry opportunities should be provided for ambitious and capable men to equip themselves for promotion. (Section 28.)

20. The workers in commerce can be divided into (*a*) merchants and industrialists carrying on transactions on their own account, (*b*) professional men engaged in the practice of banking, law, insurance, etc., (*c*) clerical workers engaged in recording the transactions of others. (Section 31.)

## *Chapter IV*

21. Effective machinery should be established for securing close and regular co-operation between industry and commerce, on the one hand, and education, on the other. This can be secured by the establishment in each Province of a Government Advisory Council for Vocational Education, which would include the Director of Public Instruction, the Director of Industries, and two or three Principals of important vocational schools ; on the side of business, it would include four or five businessmen selected by the Government on account of their knowledge and experience of particular branches of business, and not because they represented special interests.

The Advisory Council for Vocational Education would appoint Advisory Sub-Committees dealing respectively with education for (*a*) Engineering ; (*b*) The textile industries ; (*a*) Agriculture ; (*d*) Small-scale and cottage industries ; (*e*) Other industries of major importance ; (*f*) Commerce. (Sections 32, 38, 39.)

22. The functions of Advisory Sub-Committees would be to draft curricula and syllabuses of instruction, to advise on equipment, to suggest where schools should be established, to visit the schools regularly, and generally to to do all in their power to make their branch of vocational education successful. (Section 40.)

23. Employers can help in the development of vocational education in other ways—by providing buildings, equipment, materials and funds. All these forms of assistance are frequent in Europe. (Sections 43, 44, 45, 46, 47.)

*Chapter V.*

24. Vocational schools should be classified according to :—

(*a*) Their standard of admission and

(*b*) The precise vocational aim of the instruction they give. (Section 49).

25. Vocational education must be based on an adequate general education. The entrance standard should not, as a rule, be below that reached at the end of the Middle School (Class VIII). Pupils who have reached this can be admitted to " Junior Vocational Schools " Pupils who have successfully completed the Higher Secondary School course can be admitted to " Senior Vocational Schools " (Sections 50, 51, 52.)

26. Full-time vocational schools fall into three types :—

(*a*) Those which impart a vocational bias to their curricula during the last year or two of school life.

(*b*) Those which prepare their pupils for work in an occupation to be selected at the end of the course from a range of related occupations. These are " Pre-apprenticeship " schools.

(*c*) Schools which prepare their pupils for a specified occupation. These are " Apprenticeship " schools, and are sometimes known as " Trade schools " (Section 55.)

27. Schools which impart a bias to their curriculum are usually preparing their pupils for commerce. It is suggested that their general establishment in India should be postponed until the educational reconstruction now proposed is approaching completion ; but this suggestion does not apply to schools with a bias towards agriculture. (Sections 56, 57.)

28. The Junior Vocational School, receiving its pupils at the end of Class VIII and providing a three years course, would be parallel to the Higher Secondary School, and should be held in the same repute.

The Senior Vocational School, receiving its pupils at the end of Class XI and providing a two years course, would be parallel to the existing " Intermediate Colleges " (Sections 58, 59, 60, 61.)

29. Although the Junior Vocational Schools would lead either directly to employment or to further training in an Industrial School, a few of their pupils might wish to proceed to Senior Vocational Schools. In these instances, the " leaving Certificate " of the Junior Vocational School should be regarded as equivalent, for this purpose, to the certificate of matriculation. (Section 64.)

30. Part-time schools should be provided for the further education of young men already in employment and, if possible, the classes should be held in the day time, the students being released by their employers for two half days a week in order that they might attend. (Section 65.)

31. It is recommended that pupils satisfactorily completing the courses in vocational schools shall be awarded " leaving certificates " ; and that these shall testify, not only to the success obtained in the final examination, but also to the quality of the work done throughout the course. This involves keeping a record for each pupil shewing (*a*) his percentage of attendance, and (*b*) his marks for work done in the class room, the workshop, the laboratory, and at home throughout the whole of his course. (Section 68.)

32. Vocational education should be administered by the Department of Public Instruction, and until it has become stabilised, the schools providing it should be maintained and controlled by the Governments themselves and not by voluntary bodies aided by grants. (Section 70.)

*Chapter VI.*

33. A limited number of Higher Secondary schools should have a bias towards the needs of agriculture throughout their curriculum, which should be a continuation of that of the Rural Middle School. (Section 73.)

34. The type of Junior Vocational School which appears to be most necessary in India is the " Junior Technical School ", which gives a training, preliminary to employment in industries of the " manipulative " variety, suitable for boys who aim at becoming highly skilled artisans and foremen. (Sections 77, 78.)

35. The type of Senior Vocational School which appears to be most suitable is the " Senior Technical School ", which prepares its pupils for responsible posts in industries of the " non-manipulative " variety. (Section 79.)

36. Junior and Senior Technical Schools are appropriate in industrial centres only and should not be established, as a rule, in areas with a population smaller than 50,000.

37. The curriculum of the Junior Technical School should include mathematics, the scientific principles underlying the practice of the workshop, technical drawing, workshop practice in wood and metal, and English. The instruction should be in the vernacular (except, of course, in English itself), though technical terms should be given in their English form. The English taught should be of that variety which is used in the ordinary affairs of life, and no attempt should be made to give the pupils an appreciation of English literary style.

In the third year of the Junior Technical School course, pupils should begin to specialise towards general engineering practice, electric fitting, textiles, light-engineering or other industries of local importance. (Sections 86, 87, 88, 89, 90, 91.)

38. The Senior Technical School, with its two year course, should teach mathematics, physics, chemistry, mechanics, machine drawing and workshop practice, all of which are of value to a youth who is to enter one of the non-manipulative industries with the aim of occupying a position of responsibility. (Section 95.)

39. The principal of the Junior Technical School should be an engineer who has had both a university training and actual experience of industry;

the principal of the Senior Technical School should also have received a university training in science, though not necessarily in engineering ; the qualifications of the assistant staff will be determined by the subjects they teach.

In both types of school, it is of great importance that the principals should keep themselves in touch both with the schools from which they draw their pupils and with industry and commerce. They can do much to place their pupils in suitable posts on leaving, if they have established the right kind of relationships with prospective employers. (Sections 93, 94.)

*Chapter VII.*

40. The best education for the business man with great responsibilities over a wide field is not necessarily in " commercial subjects ", since what he needs is certain valuable personal qualities which can be developed by the study, under suitable conditions, of other branches of knowledge in which he is interested. For young men who have to make their own way in life, the course followed in the commercial departments of universities is, however, more suitable, since they have, from the very beginning of their commercial life, to shew that they possess exact knowledge which will make them immediately useful.

The Senior Vocational School would provide a useful preparation for students unable to undertake university studies (Sections 98, 99, 100.)

41. If it were not for the fact that many clerical workers need a knowledge of English, the Junior Commercial School would form a suitable school for training clerical workers. As it is, the conditions demand the setting up of Senior Commercial schools, which would teach English, arithmetic, the elements of accounts, geography, shorthand and typewriting. In addition, they should give their pupils a knowledge of the general structure and methods of commerce by including " the elements of commerce " in their curriculum. (Sections 101, 102, 103, 104.)

42. The normal length of the course of the Senior Commercial School should be two years, following Class XI of the Higher Secondary School.

The principal should have good academic qualifications and, if possible, should have had experience of business, though this may have been gained in industry rather than in commerce. He should cultivate the same kind of external relationships for his school as are suggested above for the corresponding technical schools. (Sections 105, 106, 107, 108.)

*Chapter VIII.*

43. The existing Industrial and technical Schools of the Punjab have undergone various changes since their development was encouraged by the Industrial Commission. At the present time, they are training pupils both for handicrafts and for work in organised industry.

The schools belonging to this group in the United Provinces are more numerous. They range from weaving schools containing a proportion of illiterate pupils, to really advanced institutions such as the Harcourt Butler Technological Institute at Cawnpore, which gives post-graduate training to young men aiming at occupying high positions in industry.

The schools in the United provinces can be conveniently classified into the following groups :—

(a) Trade Schools, where boys are trained for employment as handicraftsmen.

(b) Industrial Schools, which prepare youths for working on their own account in small-scale industries.

(c) Technical Schools, in which the students, after a sound education in the principles underlying industrial practice, or equipped for responsible industrial posts. (Sections 109 — 118.)

44. The annual expenditure on the Industrial and Technical Schools in both Provinces is high. It varies in the Punjab from Rs. 169 to Rs. 625, and in the United Provinces from Rs. 155 to Rs. 869. In the case of the larger institutions and those doing very advanced work, a high expenditure is probably justifiable ; but in the case of some of the smaller schools, doing elementary work, it is probably too high. The annual cost per pupil may be compared with that in an English Junior Technical School, where an investigation of the average expenditure on each of the 5,600 pupils in 42 schools shewed that it amounted to £ 23-2-0 (Rs. 308).

It is desirable that the Departments of Industries concerned with these schools should carefully review the expenditure. In particular, they should consider (a) the policy of concentrating the instruction into a smaller number of institutions and (b) the policy of raising the standard of entrance to some of the schools, and thus diminishing the time spent in them by each student. (Sections 120, 121, 122.)

45. Many of the schools are " monotechnics ", teaching a limited range of subjects, or, in some instances, only one subject. This type of organisation tends to duplication of certain services—supervision, clerical assistance, motive power and cleaning moreover, it is impossible to group together for instruction in subjects of common interest students taking different courses.

The " monotechnic " does not strike the imagination of the public in the same way as does a larger institution accommodating classes in a wide range of subjects. It is recommended that in each important centre of population the Government concerned should take a long view and endeavour to concentrate the classes, now scattered, into larger institutions. (Sections 123, 124, 125.)

46. Even where there is an entrance standard laid down for the admission of students, exceptions are made, in some instances, too freely. It is important, if there is to be proper economy, that there should be strict adherence to the conditions of admission. Further, when Junior Technical Schools have been established, it will be possible to cut down by one, or even two years, the course of instruction in the Industrial Schools which prepare their pupils for work in the manipulative group of industries. (Section 126.)

47. It is not possible at the present time to prescribe that pupils admitted to Trade Schools shall have passed successfully through Class VIII, though this is the ideal arrangement. It ought, however, to be possible to limit admission to pupils who have passed through Class VI. In no instance should a Trade

School be set up for training boys in a craft which is likely to be displaced by some mechanical operation. One variety of skill which is likely to be of permanent value is that used in the production of goods of artistic merit and accordingly regard should be paid to the needs of those crafts whose success depends on beauty of design and skill in workmanship. (Sections 128, 129, 130, 131, 132.)

48. In the present position of organised industry in India, it is essential that workshop practice shall occupy a prominent place in the curriculum of the full-time technical or industrial school. In Great Britain, where the standard of workmanship is often very high, it is possible to share the burden of training recruits to industry between the industry itself, which gives workshop experience, and the school, which teaches the scientific principles underlying workshop practice. But this plan is not suited to Indian conditions. (Section 135.)

49. The Industrial Schools, training persons likely to be working on their own account, should teach such subjects as drawing, book keeping and the elements of commerce, for everyone engaged in business for himself should be able to calculate the cost of his materials and his work, to buy and sell skill fully and to keep records of income, expenditure and profits. (Section 136.)

50. It is recommended that, for the present, the control of Trade, Industrial and Technical Schools shall remain with the Departments of Industries, although it is contemplated that,with the development of vocational education in India, the conditions will change and the control of these Schools may have to be transferred to the Departments of Public Instruction. (Section 140.)

51. Although the recommendation of the Indian Industrial Commerces that there should be an Imperial inspecting service for Industrial Schools has certain attractions, its adoption is not recommended. (Sections 142, 143, 144.)

52. There are certain industries in India for which the present provision appears to be inadequate. These include—the building crafts (and especially plumbing) and printing. (Sections 145—148.)

### *Chapter IX.*

53. The schools in India devote insufficient attention to the teaching of art and there is a serious risk of the artistic traditions of India being weakened. The spheres of influence of the existing schools of arts and crafts should be enlarged considerably and other schools of arts and crafts working in close association with them should be set up as opportunity serves. Far greater use should be made of the museums in the two Provinces by the gradual building up at each of them of a " Loan Collection " from which good examples and photographs of these could be lent to the Industrial and Technical Schools. (Sections 161, 162, 163.)

### *Chapter X.*

54. The Technical Schools should organise part-time day classes for young men already in employment. (Section 164 *et seq.*)

55. Since the pupils in attendance at part-time classes are gaining practical experience during their daily work, they should concentrate their attention

when at school on mathematics and those branches of science which have a close relation with workshop practice. (Section 170.)

56. The staff of teachers in part-time classes can often with advantage be supplemented by specialists from outside, who make up for any deficiency in teaching skill by the realistic atmosphere they bring into the schools. (Section 173.)

### *Chapter XI.*

57. In spite of the absence of industrial surveys in the Provinces, it was found possible to gain information relating to the methods of recruitment for (*a*) the railway service, (*b*) the Public Works Department and (*c*) the printing industry in Allahabad.

It is recommended that the conditions for admitting trade apprentices and others to the railway service and to the P. W. D. should be modified so as to give opportunities for employment to boys from Junior Technical Schools, as it is believed that this would result in the recruitment to these services of better trained boys. It would have the additional advantage of leading to the establishment in the industrial centres of Junior Technical Schools attended, in the first instance, by boys aiming at entering the railway and P. W D. service and subsequently attended, as the value of the schools became known, by boys desiring to follow careers in other industries. (Sections 174 *et seq.*).

58. It is recommended that a printing school should be set up in Allahabad, since this is an important centre of this industry. It would be preferable to accommodate it in the same premises as other branches of vocational study. (Sections 185 *et seq.*)

### *Chapter XII.*

59. It is recommended that the Government of India shall take steps to re-organise the whole of the educational system of the Province of Delhi and, at the same time, to seek the collaboration of the Governments of the Punjab and the United Provinces in a scheme for the training of vocational teachers for all three provinces, at least.

On the vocational side of the re-organisation, it would be necessary to establish on the same site and under the same principal—

(*a*) a Vocational Training College, working in close association with an ordinary Training College for teachers in each of the other two provinces,

(*b*) a Junior Technical School, providing, during the first two years of its course, instruction in mathematics, science, technical drawing, wood and metal work, and English ; and, during its third year, instruction specialised in accordance with the needs of general engineering, electric wiring and textiles.

(*e*) a Technical School attended by part-time as well as full-time industrial and commercial students.

(*d*) a School of Arts and Crafts.

Teachrs in training at the Vocational Training College would use the technical and art schools as practising schools. The premises of the existing Government High School in Delhi appear to be suitable, with the necessary extensions, for all these purposes. (Sections 192 *et seq.*)

*Chapter XIII.*

60. In view of the importance of the vocational guidance of boys when they are on the point of deciding upon their future occupations, it is desirable that the problem of devising suitable methods for this should be attacked in India, as it has been in so many other countries. But the problem is so complex that it would probably be necessary for a number of the Provinces to co-operate with one another in the task of finding a solution. (Sections 212 *et seq.*)

61. The adoption of the recommendation of the Unemployment Committee of the United Provinces that the Government should publish a series of pamphlets describing careers for boys and the preliminary education needed for each career would without doubt serve a useful purpose. (Section 218.)

A. ABBOTT.

*May, 1937.*

# APPENDICES.

## APPENDIX I.

*The Curriculum, Accommodation and Equipment of a Junior Technical School.*

Although each Junior Technical School draws up its own curriculum and syllabuses, the following, which are in use in a very successful English school of this grade, is typical of all of them.

### Curriculum.

*Summary of Time Table.*

| Subject. | | 1st Year. 45 min. periods. | 1st Year. Hrs. & Mins. | 2nd Year. 45 min. periods. | 2nd Year. Hrs. & Mins. | 3rd Year. 45 min. periods. | 3rd Year. Hrs. & Mins. |
|---|---|---|---|---|---|---|---|
| English .. | Lit. and Essay | 5 | | 4 | | 3 | |
| | History | 2 | 6— | 2 | 5·15 | 2 | 5·15 |
| | Geography | 1 | | 1 | | 2 | |
| Mathematics | | 8 | 6— | 7 | 5·15 | 6 | 4·30 |
| Drawing .. | Geometrical | 4 | | 2 | | 2 | |
| | Machine | 2 | 6— | 3 | 5·16 | 2 | 4·30 |
| | Structural | | | | | 2 | |
| | Art | 2 | | 2 | | .. | |
| Science .. | Appd. Mechs. | | | 3 | | 3 | |
| | Physics | 5 | 3·45 | 2 | 6— | 3 | 6·45 |
| | Chemistry | .. | | 3 | | 3 | |
| Workshop | Metal | 2 | | 4 | | 6 | |
| | Wood | 4 | 4·30 | 2 | 4·30 | | 5·15 |
| | Materials and Processes. | | | | | 1 | |
| Physical Exercises | Gymnasium | 2 | 3·45 | 2 | 3·45 | 2 | 3·45 |
| | Games Field | 3 | | 3 | | 3 | |
| Assembly and Prayers | | | 50 | | 50 | | 50 |
| Recreation | | | 50 | | 50 | | 50 |
| Totals | | | 31·40 | | 31·40 | | 31·40 |

Notes :

1. One half of one of the third year classes specialises in Toolmaking, and does an extra three periods in the workshop, losing thereby three periods of chemistry.
2. One third year class spends two periods in the Electrical Installation department, and loses thereby two periods of Metalwork.

## SYLLABUSES.

### *English.*

The aim of the instruction in this subject is to develop clear, concise expression in speech and in writing.

The syllabus is not given, since it is not suitable for use in Indian schools.

## METHEMATICS.

### *1st Year Syllabus.*

*Arithmetic*—

Multiplication and division of decimals. Factorisation ; L. C. M.; vulgar fractions (not too complicated).

Averages ; ratio, proportion ; conversions (*e.g.*, miles per hour to feet per sec.; lbs. per square inch to grams per sq. cm.) ; percentages, particularly percentage alterations such as in gain or loss, stretching of a wire, change of resistance of a conductor when heated.

Square root and theorem of Pythagoras.

Logarithms of numbers greater than 1, and use of these for products, quotients and square roots.

*Mensuration*—

Rectangle, parallelograms, rhombus, triangle (area by $\frac{1}{2}$bh or by "s" rule) trapezoid, circle. Surface area and volume of cube, prism, cylinder, cone and sphere.

*Algebra*—

Meaning and use of symbols ; coefficient, index, term, factor. Rules of signs Addition, subtraction, multiplication, division. Simple fractions : simple equations and transpositions ; simultaneous equations (two unknowns) Factorisation. Solution of Quadratics by factorisation and by completing the square.

*Graphs*—

Simple plotting (careful attention to style, choice of scales, etc.). Plotting of straight lines from their equations.

*Trigonometry*—

Meaning of sine, cosine and tangent ; reading from the tables, solution of right-angled triangles.

*Experimental Mechanics*—

Plotting of position diagrams.

### *2nd Year Syllabus.*

*Algebra*—

Revision of 1st year work, made more complete by practice in problems on that work. Harder fractions ; literal equations ; solution of quadratics by use of the formula ; variation ; arithmetical and geometrical progression ; indices ; general use of logarithms.

*Trigonometry*—

Revision and extension of work on solution of right-angled triangles ; ratios of angles from 0° to 180°; the co-ordinates of $^{h}x$ as h cos a and h sin a ; radiaus and length of arc.

*Mensuration*—

Revision of 1st year work, with technical bias to exercises. Length of chord of a circle ; frustum of pyramid and cone ; similarity. Easy problems on calculations of weights.

*Geometry*—

Line and angle properties of the circle.

*Graphs*—

Plotting of $y=ax^2+bx+c$, $y=ax+bx+cx+d$, $xy=c$. Equation to a straight line Areas by mid-ordinate rule.

*Experimental Mechanics*—

Displacement and velocity diagrams ; change of velocity ; motion of a falling body ; trolley experiment ; motion of a projectile ; motion of a pendulum ; vector balance experiments ; momentum ; force as the rate of change of momentum ; Newton's Laws.

*Slide Rule*—

Use for multiplication and division.

*3rd Year Syllabus.*

*Algebra*—

Revision, indices and theory of logarithms, use of logs for negative powers ; simultaneous equations (three unknowns); simultaneous quadratics.

*Trigonometry*—

Ratio of angles of any magnitude ; solution of triangles by "sine" and "cosine" rules. Easy equations.

*Graphs*—

Sine, cosine and tangent curves ; slope curves ; graphic solution of equations ; circle ; ellipse ; hyperbola, determination of laws of types $f(y)=af(x)+b$, $y=ax_n$ ; areas by Simpson's rule.

*Calculus*—

Meaning of $\frac{dy}{dx}$ and $\frac{dy}{dx}$.

Differentiation of $ax^n$, sin nx, cos nx, product and function of a function. Integration. An area as a definite integral.

*Experimental Mechanics*—

Angular Velocity ; uniform motion in a circle ; measurement of a blow ; change of angular momentum ; moment of inertia of bar and of cylinder.

*Slide Rule*—

General use with special attention to particular settings, *e.g.*, volume of a cylinder, solution of triangles by sine rule, etc.

*Applied Mechanics.*

NOTE.—The study of this subject is not begun until the second year of the course.

*2nd Year.*

*Force*—

Definition and representation, summation of forces in straight line. Parallelograms, triangle and polygon of forces. Resultant, equilibrant and component forces. Velocity and acceleration.

*Principle of Moments.*—The lever ; beam reactions.

*Unit of Force.*—Time. Work and Power. Gravity.

*Variable forces.*—Time and space averages.

*Representation of work* by area.

*Horse power and Efficiency.*—

*Friction.*—Co-efficient of friction ; work done against friction ; movement of bodies on inclined planes.

*Machines*—

Definition and types ; velocity ratio ; mechanical advantage ; efficiency. Experiments with machines ; calculations upon, and plotting of curves shewing characteristics of machines. Finding the law of a machine ; using pulley on axle with thick and thin cords ; wheel and axle ; pulley blocks ; Chinese windlass, screw-jack and Weston's blocks.

*Strength and Characteristics of Materials.*—Elementary notions.

*Hydraulics.*—Elementary notions.

*3rd Year.*

*Materials*—

The elastic law. Limit of proportionality. Stress, strain and modulus of elasticity. Compression and shear. Elementary ideas of ductility, brittleness and hardness. Resilience. Principal properties of common engineering materials.

Revision of reactions at supports of beams. Bending moment and shearing force diagrams for concentrated loads on cantilevers and simply supported beams. Stresses in the flanges of I—girders and rectangular beams due to bending moment.

*Motion*—

Revision of ideas of displacement, velocity, acceleration and vector representation. The fundamental relations between force, mass and acceleration (engineer's units). Momentum. Centrifugal force.

*Energy*—

Forms of energy. Conservation of energy. Flywheel and pendulum problems on work. Tractive effort, and work done on inclines.

*Machines*—

Revision of velocity ratio and mechanical advantage. Energy methods. Efficiency and consideration of shape of curves of performance.

*Laboratory Work*—

Boys work in groups of two. As far as possible, experimental confirmation follows the enunciation of principles in the class-room, but this is not always possible, and sometimes a simple experiment precedes class treatment. The methods of demonstration by teacher and selected boys is used when preferred.

*Chemistry.*

NOTE.—The study of this subject is not begun until the 2nd Year of the Course.

*2nd Year.*

Solution, evaporation, sublimination, distillation.

Crystallization, water of crystallization.

States and properties of matter.

Action of air on metals and of metals on air.

Rusting and combustion of metals and non-metals, leading to study of oxides, oxidation and reduction.

Chemical combination, atomic theory, elements, compounds, mixtures.

Laws of conservation of mass and of constant proportion.

Symbols, formulæ, equations.

Water as an oxide.

Electrolysis of water, leading to a study of hydrogen.

Electrolysis of hydrogen chloride, evolution of hydrogen from hydrochloric acid by electrolysis and by replacement by metals.

Action of metals on common acids, formation of salts by displacement of hydrogen.

Classes of oxides, acidic and basic oxides.

*3rd Year.*

Formation of salts by neutralisation, quantitative considerations.

Equivalent weights, atomic weights, valency.

Carbon dioxide, carbonates and bicarbonates as salts.

Chalk and lime ; hardness of water.

Industrial applications of carbon dioxide—the ammonia-soda process.

Sulphur, its oxides and oxy-acids.

Nitrogen, ammonia, nitrates and nitric acid.

Law of Multiple Proportions.

Fuller study of hydrochloric acid and chlorine.

Avogadro's Hypothesis and Law of Gaseous Volumes

Common metals—iron, zinc, copper, lead, aluminium, chromium, etc.

*Physics and Electrical Engineering.*

NOTE.—The introduction to Electrical Engineering is postponed to the 3rd year.

*1st Year.*

The use of metre rules, calipers, vernier calipers, screw gauges, etc., for the measurement of length and volume.

*General Physics—*

Units of length, mass and time. Measurement of length ; parallax. Micrometer Vernier. Measurement of areas (counting squares). Measurement of volume (graduated cylinder). The balance. Density of solids (measuring volume by graduated cylinder). Density of water. Density of liquids by specific gravity bottle. Principle of Archimedes. Specific gravity of solids heavier than water. Hydrometers. Pressure. Barometer. Here's apparatus. Notes on capillarity.

*Heat—*

Production of heat and its effects. Heating and cooling curve of water. Flow of heat. Thermometers ; fixed points of a thermometer ; calibration ; conversion of scales, Effect of mixing equal quantities of water at different temperatures. Effect of mixing unequal quantities of water at different temperatures. Water equivalent of Calorimeter. Specific heat of solids and liquids. Change of state . Latent heat of steam. Cooling curve of paraffin wax. Expansion of metals. Coefficient of linear expansion. Conduction. Effect of lagging a calorimeter. Convection and applications. Thermos flask.

*Light—*

Demonstration that light travels in straight lines. Laws of reflection. Position of image—plane miror. Tracing the path of a ray of light through a block of glass.

*2nd Year.*

*Heat—*

Revision. Expansion of solids , liquids and gasses. Boyle's Law. Charles' Law.

*Light—*

Revision of Laws of reflection. Path of a ray through glass. Refractive index. Ratio of real and apparent depths. Reflection from spherical mirrors. Prisms. Spectrum. Lenses. Graphical construction for image. Bunsen phortometer. Comparison of candle power of lamps.

*Magnetism*—

Properties of magnets. Comparison of magnet and magnetic substances. Molecular theory. Plotting magnetic fields by compass and by iron filings. Earth's magnetic field. Magnetic field due to current in a straight conductor and in solenoid. Magnetometer.

*Electricity*—

Preparation of Wires. Circuits and circuit diagrams. Electrolysis. Primary cells.

*3rd Year.*

*Electrical Engineering*—

The C. G. S. Units. Definition of the dyne and the erg. Revision of magnetism. Magnetic fields. Lines of magnetic force, their distribution and behaviour. Definition of field strength. Magnetic induction. Permeability. Resonance. Magnetic properties of iron and steel. Revision of electrolysis. Faraday's Laws of Electrolysis; applications. Revision of magnetic effects of current. Maxwell's Cork screw Rule applied to straight conductor, coil and solenoid. Electromagnets; their winding and use as compared with permanent magnets. Ohm's Law; difference between E. M. F. and P. D. of a Generator. Definition of the Ampere, Volt and Ohm, and their relation to the Electromagnetic Units. Calculations on Ohm's Law and measurement of the internal resistance of cells. Resistances in series and in parallel. Specific resistance. The simple Potentiometer. The Wheatstone Bridge. Metre Bridge. The Post Office Box.

Revision of Heat and its measurement. Specific Heat. Heating effect of a current. Relation between electrical energy and heat. Electric radiators, etc. Costs of running electrical apparatus. The Joule, the Watt, and the B. O. T. Unit. Measurement of electrical power. Instruments: Galvanometers, Ammeters, Voltmeters and the variation of their range with the aid of Shunts and Series Resistances. The construction, action, use and care of primary and secondary batteries. Electromagnetic induction. Faraday's and Lenz' Laws. Principle of the Electric Generator. Ring Armature; Commutator. Difference between A. C. and D. C. Principle of the Electric Motor; Fleming's Rules for Motor and Dynamo. Principle of the starter for a Motor. Elementary Principle of the Transformer and Induction Coil.

## Technical Drawing.

I

*Practical Geometry.*

NOTE.—This subject should be taught so as to assist the Machine Drawing, *i.e.*, rather as a means than as an end in itself.

*1st Year.*

*Plane*—

Use of instruments and appliances. Points, straight lines, perpendiculars, angles' Properties of triangles, proportionals, scales, regular and irregular polygons, areas, circles' and tangents to circles. Construction of the ellipse by several methods.

*Solid*—

Plain, elevation and ground line. Simple solids, cubes, prisms and pyramids (tri., sq., hex., oct.) cone. Use of end views. Simple sections of these solids. Isometric projection.

*2nd Year.*

*Plane*—

The ray method, involving points, lines and angles, curved and rectilinear figures; reduction to figures of equal area; construction of figures from given data; problems elating to circles and straight lines; simple problems on cams, loci and mechanism.

*Solid*—

Problems on points and lines introducing co-ordinate planes with end view. Indices, treated very simply. Points, lines, true lengths, inclinations and traces of lines mainly from given plan and elevation. Projection and auxiliary projection of simple and special solids. Perpendicular plane; sections cut by it; projection of rectilinear figures in inclined positions, and of solids involving the above from given data.

*3rd Year.*

*Plane*—

The conic sections treated very simply. Construction and properties of the ellipse ; circles and tangents ; problems involving ray method for reduction and enlargement of figures to equal areas. Problems on polygons, loci, cams mechanism and the helix.

*Solid*—

Revise work of previous years. Projection of solids from written data only. Sections and true forms of same ; new views of solids to conditions of line, of face or axis in certain positions. Perpendicular and inclined planes and sections cut by them, also rebatments of figures on them. The oblique plane, traces, inter-sections ; angles of inclination. Use of auxiliary ground line. Three points in plane. True angles between traces ; dihedral angles of faces of pyramid. Use of indices and contours. Interpenetration of solids ; two cylinders ; and cylinder and cone ; prism and pyramid and sphere and prism. Application to engineering problems—boiler shells, domes, connecting rods, etc. Isometric projection with curves. Development of surfaces.

II

MACHINE DRAWINGS.

*1st Year.*

Notes on pencils, paper and instruments. Fixing , heading and arrangements of work on paper. Use of squares. Lettering, figuring and dimensions.

Working drawings of the models to be made by the boys in the workshops are first produced. Other simple models are then sketched and drawn, attention being given to descriptive names and to the purposes the parts serve.

Importance is attached to neat and clear drawings and to the production of good lines, lettering and dimensioning.

*2nd Year.*

Talks are given on machine details , the functions of parts being explained ; the materials used and the reasons for their choice will be given. Notes are given in screw threads—accurate shapes and conventional representation ; standard proportions of bolts and nuts ; types of bolt heads ; bolt and nut, castle nut, etc.

Details such as riveted joints, spanners (with general idea of proportions), gland and stuffing box, simple valves, etc., are sketched, freehand and in pencil, from the actual articles and the sketches dimensioned after the articles are measured up. A schedule of parts is included where necessary ; each view is named and each section plane indicated. Assembly and detail drawings with sections are prepared from the freehand sketches.

*3rd Year.*

The work progresses on lines laid down in the previous years. Special attention is given to correct dimensioning, good proportions and quality of lines.

The drawings to be made are chosen from common engineering details, connecting rods, valves, etc. Working drawings of workshop models are also prepared. Tracings of some drawings are made and each boy is taught blue printing.

Further talks on engineering details are given and drawing office organisation is discussed.

III

## Structural Drawings.

Note.—This subject is intended to treat the various problems of structural engineering, and all the allied types of engineering where structures occur, by graphical solutions as used it the drawing office. This should assist any calculated investigation, and where possible, nhe alternative solutions are mentioned.

*General*—

Composition and resultant of parallel forces; Bow's notation for describing forces; resultant of system of parallel forces; resultant of forces in any direction. General problems in frames using space diagrams, polar diagrams and the funicular polygon. Resolution and reactions with problems on beams and framed trusses.

*Framed Structures*—

Reactions for roof trusses and cantilever frames; stress diagrams with problems on the most common framed structures; effects of wind and oblique loads with examples shewing how the stresses may be combined or treated separately; Warren girders, N girders, Pratt and Fink trusses with examples and problems on pent roofs.

*Beams*—

Graphical solutions for the reactions and the resultant load on a beam, with problems using concentrated and distributed loads or combinations of both. Shear and bending stresses in beams and how they are caused; problems on the graphical construction of the shearing force and bending moment diagrams of a beam for concentrated, distributed or any form of loading. Laws of strength of solid rectangular beams; neutral axis; resistance figures and the moment of resistance with simple problems on the construction of these figures. The modulus of a beam and its application to problems for comparing a beam's strength.

## Woodwork.

### *1st Year.*

The instruction will include the necessary drawing to scale. The work will be made from these drawings. Sketching from models will form an important part of the early training.

Construction and uses of the various tools and methods of manipulation.

Nature and properties of the various kinds of timber.

The following exercises and models will be worked upon. Each exercise is so arranged that a progressive tuition in the use of tools, and in the making of models and patterns is obtained.

Sawing and chiselling exercises.

Housing groove and torque joints.

Dovetail halving and bridle joints.

Inlay square on diagonal.

Pattern and core box for a bush.

Pattern for a fire bar.

### *2nd Year.*

Models and joints of a more complex character, introducing new tools and methods of construction.

Elementary pattern making. Wood turning, use of various machines, such as band saw, circular saw, planer.

The use of patterns and draw will be demonstrated with moulding sand. The following models and patterns will be made :—

Mortise and tenon joints.

Pattern for :—

Base of surface gauge.

Surface plate.

Small hand wheel.

Plummer block, with cap.

Wall brackets.

Bottle jack.

Spur wheel.

Large hand wheel.

Pipe joint with core box.

## Workshop Materials and Processes.

*3rd Year only.*

| | |
|---|---|
| *Engineers' Tools* | Uses and descriptions. |
| *Smiths' Tools* | Uses and description. Welding. Hardening and tempering. Power hammers, etc. |
| *Machine Tools* | Diagrams shewing arrangements. Centre Lathe. Details, tools and tool slides ; making, hardening and tempering tools for special purposes. Calculations on screw cutting, and trains of wheels. Calculations of speeds and feeds for work. Type and proportions of screw threads, and various methods of cutting threads. |
| *Files* | Manufacture and types. |
| *Emery Wheels* | Manufacture, types, calculation of speeds. |
| *Transmission of Power* | Various forms of mechnical power transmission. Belts gears, ball bearings, clutches. Gear cutting, Chain drives. Calculation for gears. Notes on dividing head for gear cutting. |
| *Keys and Feather* | Types, uses, method of fitting, sliding fits, driving fits, etc. |
| *Workshop hints* | General talks. |
| *Materials* | Materials used in engineering work. Iron ores. Manufacture of pig iron, grey iron, mild steel, cast and alloy steels. Non-ferrous metals with proportions of constituents. |
| | Methods of casting, forging, stamping, etc. |
| | Sketches of furnaces, cupolas, etc. |

## ENGINEERING WORKSHOP PRACTICE.

### Three Year Course.

*1st Year* (one period of $1\frac{1}{2}$ hours weekly).

Elementary operations and processes such as soldering, marking out (two dimensional only), filing and polishing, chiselling, drilling, metal bending, light riveting, etc., are covered by such models as the following :—

1. (*a*) Simple lap joint using tin plate.
   (*b*) Simple lap joint using any unprepared material—the joint to be tested on com pletion.
2. Riveted prism with cover plate joint.
3. Iron hinge.
4. Internal and external 90° angle guage.
5. Ring spanner.
6. Hexagonal gauge.

*2nd Year* (two periods of $1\frac{1}{2}$ hours weekly).

More advanced work including marking off (three dimensional), tapping and the use of stocks and dies, hardening and tempering, case hardening, the assembly of parts, etc. The use of the lathe—plain turning, centring in three and four jaw chucks, turning between centres. Knurling and turning to size for screwing, and more advanced drilling practice are dealt with in this year. The models made include 1″ cube, centre punch, square carrier, calipers, tap wrench, depth gauge and square.

In the first and second years, talks upon the various processes involved in the work are given in the shop in conjunction with the practical work. The boys make their own notes and for homework record them in a special note book.

*3 Year* ($4\frac{1}{2}$ hours on one day a week).

The general third year course covers advanced bench work, fitting and assembly of parts and the use of such precision instruments as micrometer and vernier. The machines used are :—

*Lathes* of various types.

Work is of greater precision than in the second year and includes screw cutting.

*Milling machines* (both horizontal and vertical).

The use of the dividing head in milling is taught.

*Shaping machines.*

*Drilling machines. Power saw, etc.*

*Grinding machines.*

Besides using these machines, the boys are taught how to mark out and set up a job correctly.

The models made include toolmaker's clamps, toolmaker's vice, surface gauge, adjustable spanner, square and vee thread taps, reamers, vee blocks, stock and die, lifting jack, spiral fluted reamer, large clamps and small bench vice.

Demonstrations in oxy-acetylene and electric are welding are given.

During this year a weekly lecture of 45 minutes duration is given on Materials and Processes (See separate syllabus).

A group of selected boys spend an extra half day per week in the machine shop when they receive some specialised instruction in tool-making. These boys make various small tools, gauges and simple press tools.

## ENGINEERING WORKSHOP PRACTICE.

### ALTERNATIVE SCHEME.

*Two Year Courses.*

The following scheme of instruction in engineering workshop practice is less ambitious than the one previously described.

It occupies two years only, and each boy is expected to spend from three to six hour a week in the metal workshop.

*Range of Materials* — Wrought iron, mild steel, carbon tool steel, cast iron, cooper, aluminium, zinc, brass.

*Range of Processes* — (*a*) *Hand Processes—*

Cutting with snips, hacksaw and chisel.

Chipping, filing, scraping and polishing.

Screwing with taps and dies.

Sheet—metal work—forming, beading, riveting.

Forge work—drawing down, bending, upsetting.

Hardening, tempering and annealing.

Marking out.

(*b*) *Machine Processes—*

Drilling with Brace, Sensitive and Pillar drills.

Sliding, surfacing and taper turning in Centre.

Lathe.

Shaping.

Simple tool grinding.

Screw cutting.*

Milling.*

*Range of Machine Tools* — Drills : Centre Lathes : Shapers : Tool Grinders : Power Hacksaw.

Miller.*

*NOTE— For those pupils who take a longer course than that covered in two years.

*Accommodation and Equipment of a Junior Technical School—*

The ordinary accommodation of a Junior Technical School should be like that of a Higher Secondary School. In addition, it needs a large science laboratory (about 1,000 square feet), a Woodwork room (at least 800 square feet) and an Engineering Workshop (at least 1,000 square feet).

The *Laboratory* should be equipped in the same way as a Physical laboratory usually is, but it should have one or more blank walls on which apparatus can be fixed. It is desirable that there should be one or more light girders fixed across it at a height of seven or eight feet, so that apparatus can, when necessary, be suspended from it.

It is an advantage to have a small chemical laboratory also, though this is not absolutely necessary, since the amount of chemistry included in the curriculum is small.

The Woodwork room should have properly fitted carpenter's benches for about 24 pupils. Space is needed for a lathe and a grindstone ; and there should be a store for timber and for the articles made by the pupils. A blackboard should be attached to one of the end walls.

The *Engineering Workshop* should have the following equipment, which is sufficient for classes of 20—25 pupils :—

Benches with 24 vices.

2 Forces with anvils and tools.

1 Sensitive drill (pillar or bench type).

1 Pillar drill up to ¾ inch.

5 Centre Lathes, mainly 6 inch.

1 Shaper, 10 or 12 inch.

1 Tool grinder.

1 Power hacksaw.

1 Miller.*

This equipment, which is suitable for the " Alternative Scheme " described in this Appendix, would cost about £1,000. This estimate includes the provision of separate electric drives for the machine tools, and also of the miller and its accessories.

* For the use of pupils taking a longer course.

## APPENDIX II.

### The Elements of Commerce.

The following syllabus is suggested for consideration by teachers of this subject.

*First Year.*

*Retail Trade—*

(*a*) The organization and functions of a retail business.

(*b*) The purchase of goods from wholsesale dealer or the manufacturer. Price lists. Trade Discount. Invoices. Methods of payment:—cheques, money orders, postal orders. Profits:—gross profit, working expenses, net profit. Turn-over. The relation of net profits to turn-over. Net profit divided into (*i*) remuneration of mangement, (*ii*) interest on capital.

(*c*) Simple explanation of the banking system. Current and deposit accounts. The Bankers' Clearing House.

*Wh olesale Trade—*

(*a*) The wholesale warehouse. Its organisation and functions. Purchase and sale of (*i*) manufactured goods; (*ii*) raw materials and foodstuffs. Carriage of goods and its cost (using official tables). Terms of payment. Inland bills of exchange and promissory notes.

Throughout the instruction arithmetical exercises should be set wherever possible; and examples of the documents used should be available as illustrations.

*Second Year.*

The work in this year will be mainly a repetition of that done in the first year, but it will deal in greater deail with the various topics.

(*a*) *The constitution of the firm.—*

(*i*) The sole trader.

(*ii*) Partnership; its legal and economic aspects. The various modes of remuneration of partners.

(*iii*) The Company with liability limited by shares—the Memorandum and Articles of Association; the nominal or authorised capital; the subscribed capital; the called-up capital and the paid-up capital. The division of capital into various classes of shares. The borrowing of capital by means of Debentures. The transfer of shares (or stock) and Debentures (or Debenture stock). The Private Company. Co-operative societies.

(*b*) *Co-operation amongst business units.*

(*i*) Conformity with the conditions of purchase and sale laid down by an association of traders.

(*ii*) The association of business units into Kartels formed with the object of limiting or excluding competition within a defined market by either—the allocation to each business of a specified area of the market; the fixing of minimum selling prices within the market; or the establishment of a separate selling organisation for the market.

(*iii*) Combines or Trusts. The combination of individual business units into larger units.

(*c*) *Money and Exchange.*

Money as a medium of exchange: effects of variations in its purchasing power.

The Indian monetary system.

Joint-stock banks: bank notes and deposits as substitutes for metallic currency: the limitations on the issue of bank notes. Methods of opening and operating a banking account: classes of accounts.

(*d*) *Export Trade.*—

Means of procuring orders: quotations: indents: functions of merchants, shippers, packing and forwarding agents; documents relative to shipping and insurance.

(*e*) *Import Trade.*—

Functions of import merchants and brokers; procedure in obtaining delivery of dutiable and non-dutiable goods; bonded warehouses. General knowledge of the methods of payment relating to exports and imports.

## APPENDIX III.

*Occupations taught in the Trade Schools of the Paris Chamber of Commerce.*

(NOTE :—Only the main groups are mentioned, although a number of them include several separate trades.)

*For Boys.*

Blacksmith's work.

Engineer's fitting.

Tinsmith's work.

Metal plate work.

Engineer's Patternmaking.

Moulding.

Printing, including :

- Typography,
- Lithography,
- Photogravure.

Bronze casting.

Art metal work (iron).

Stone carving.

Scientific instrument making

Surgical instrument making.

Tailoring.

Carpentry and Joinery.

Plumbing.

Glazier's work.

Cabinet making.

Pottery.

Butcher's work.

Baking.

Cookery (chefs).

Grocery.

Confectionery.

Hotel work.

Retail selling, including :

- Ironmongery,
- Haberdashery.

*For Girls.*

Flower making.

Embroidery.

Dressmaking.

Lingerie.

Millinery.

Lacemaking.

Corset making.

Furrier's work.

Dyeing.

Cleaning of textile goods.

Laundry.

Domestic crafts.

Retail selling.

*For Boys and Girls.*

Stationery manufacture.

Cardboard work.

Book-binding & gilding.

Leather work, including the manufacture if

- Purses,
- Ladies' bags,
- Suit cases.

# APPENDIX IV.

*Suggested Courses of Instruction for Part-time Students.*

It will be noted that the following courses of instruction, being intended for students who are already in employment, include no instruction in workshop practice. They are intended to be complementary to this, and invariably include mathematics, drawing and science, although the content of the syllabuses of instruction in these subjects differs in accordance with the nature of the industry in which the students are engaged.

The teaching of science, in particular, assumes new forms when workshops, originally intended for the purpose of producing goods, are employed as laboratories. The students should not be concerned as a rule with learning the ordinary methods of production, but with becoming familiar with the principles underlying production. For example, students of cotton spinning should not attempt to turn out great quantities of yarn, but should undertake the systematic investigation of the way in which the various functions of cleaning the raw material, attenuating, twisting it, etc., are performed by the different machines, and should concentrate on ascertaining the effect on the product of the variations which they make in the adjustment of the different elements constituting the complete machine. In this instance, science has become what is termed "technology". The method is scientific, but its form is different from what it usually is in the laboratory.

## Mechanical Engineering Course.

*First Year.*

Mathematics.

Engineering Drawing.

Engineering Science.

*Second Year.*

Mathematics.

Engineering Drawing.

Engineering Science.

*Third Year.*

Mathematics.

Applied Mechanics.

*One* of the following :—

Heat Engines.

Engineering Drawing.

Electrical Engineering.

*Mathematics.*

In this subject, the general principles should first be taught; this should be followed by abundant practice in their application to such practical problems as come within the range of understanding of the students.

It is important that from the first the students should be trained in the use of graphs for both the respresentation of varying quantities and the solution of equations. In the second year, students should be introduced to the idea of differentiation, while in the third year they should acquire a fair knowledge of the elements of the calculus and should be taught to apply it to determining area, centre of area, Guldinus' Theorem, moments of inertia, etc.

*Engineering Drawing.—*

The main object of the instruction in this subject is to enable students to "read" an engineering drawing, that is, to visualise machine details from a drawing giving two or more views.

The most important part of the instruction is probably the making of dimensioned hand-sketches from actual machine details, of which there should be a plentiful supply available. From these sketches, plans and elevations should be made to scale, and these views should be combined to complete isometric drawings of the examples. The mere copying of drawings should be avoided.

*Engineering Science.*

Since every mechanical engineer should have some knowledge of electro-technics, the elementary treatment of this subject is included in the course. Engineering science includes the study of force, work and friction, machines, electro-technics, energy and power.

In Electro-technics, students should gain an acquintance with : magnetising force, magnetic field strength, electro-mgnets, magnetic field of a simple machine, potential difference, electro-motive force, Conducting and insulating materials. Resistance of conductors ; resistivity. Units—the ohm, ampere, coulomb, volt. Ohm's Law. Simple and divided circuits. Principles and use of galvanometers, ammeters and voltmeters.

## Cotton Spinning Course.

*First Year.*

Cotton Spinning.

Textile Mathematics.

Textile Drawing.

*Second Year.*

Cotton Spinning.

Textile Mathematics.

Textile Science.

*Third Year.*

Cotton Spinning.

Textile Mathematics.

Textile Science.

*Cotton Spinning.*

The instruction in this subject should begin by giving the students in their first year ageneral view of the whole of the processes from the opening and cleaning of raw cotton to its spinning on ring frames and on mules. While the various mechanisms should not be discussed in great detail, students should have exact notions of the functions they perform in the long series of operations involved in the transformation of raw cotton into finished yarn.

In the Second and Third Years, the machines and the several functions which each of them is performing should be studied in detail.

*Textile Mathematics.—*

Students of cotton spinning need not carry their knowledge to such an advanced stage as students of mechanical engineering, but, so far as it goes, their knowledge of mathematics should be thorough. They should be familiar with algebra, the use of logarithms, the elements of trignometry and the use of graphs ; and they should be accustomed to applying their skill to the calculations required in spinning.

*Textile Drawing.—*

The instruction in this subject should enable students of cotton spinning to understand drawings of textile machinery, and to make suitable dimensioned sketches of simple parts of spinning machinery. Necessarily, the machine details used should be those found in a spinning mill.

*Textile Science.*—

The instruction in this subject should include the more elementary scientific principles needed in order to understand the materials and the operations of the spinning mill.

It should include a knowledge of—solids, liquids, gases; pressure and volume; Boyle's Law; the barometer; the principles of Archimedes; capillarity and surface tension.

Friction; co-efficient of friction; the advantages and disadvantages of friction; work done in overcoming friction; oils and lubrication; the use of ball and roller bearings.

Heat and temperature; expansion of solids, liquids and gases; the thermometer; Charles' Law; change of state; melting and boiling points; vapour pressure; humidity; wet and dry bulb thermometers; specific and latent heat; conduction, convection and radiation.

Work and energy; the principle of work; power; efficiency of the machine.

The principle of moments; weighing machines.

Stress and strain; Hooke's Law, fatigue of materials.

Dynamics; Newton's laws of motion; falling bodies; kinetic energy; momentum; centrifugal force.

Horse-power; work transmitted by the effective tension of a rope or belt.

Machines; mechanical advantage and efficiency.

Communication of motion; belt driving and velocity ratios of simple and compound straight drives; the convexity of pulley rims, the effect of slip on velocity ratios; tooth gearing; the velocity ratio of a simple and compound train of wheels; differential motions; chain drives, worm drives, and racks; calculations on the surface speeds of rollers and drafts between rollers; intermittent motion drived from ratchet wheels.

These two courses of instruction for part-time students have been described in some detail because they are constituted rather differently. The course in mechanical engineering cannot be regarded as possessing a central subject. It consists of three subjects—mathematics, drawing and science—which are cognate to each other. The course in cotton spinning differs from it in having a central subject—cotton spinning—with which are associated the ancillary subjects of mathematics, drawing and science.

It will be found that every grouped course of part-time instruction will have a general resemblance to either one or the other of these two main types.

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